

# The L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> Sources

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# File a

## ltdirchk.dtx

### 1 L<sup>A</sup>T<sub>E</sub>X System Dependent Initializations

This file implements the semi-automatic determination of various system dependent parts of the initialization. The actual definitions may be placed in a file `texsys.cfg`. Thus for operating systems for which the tests here do not result in acceptable settings, a ‘hand written’ `texsys.cfg` may be produced.

The macros that must be defined are:

`\@currdir`     `\@currdir{filename}{space}` should expand to a form of the filename that uniquely refers to the ‘current directory’ if this is possible. (The expansion should also end with a space.) on UNIX, this is `\def\@currdir{./}`. For more exotic operating systems you may want to make `\@currdir` a macro with arguments delimited by `.` and/or `{space}`. If the operating system has no concept of directory structure, this macro should be defined to be empty.

`\input@path`     If the primitive `\openin` searches the same directories as the primitive `\input`, then it is possible to tell (using `\ifeof`) whether a file exists before trying to input it. For systems like this, `\input@path` should be left undefined.

If `\openin` does not ‘follow’ `\input` then `\input@path` must be defined to be a list of directories to search for input files. The format for each directory is as for `\@currdir`, normally just a prefix is required, but it may be a macro with space-delimited argument. That is, if `{dir}` is an entry in the input path, T<sub>E</sub>X will try to load the expansion of `{dir}{filename}{space}`

So either `{dir}` should be defined as a macro with argument delimited by space, or it should just expand to a directory name, including the final directory separator, so that it may be concatenated with the `{filename}`. This means that for UNIX-like syntax, each `{dir}` should end with a slash, `/`.

`\input@path` should expand to a list of such directories, each in a `{}` group.

`\filename@parse`     After a call of the form: `\filename@parse{filename}`, the three macros `\filename@area`, `\filename@base` and `\filename@ext` should be defined to be the ‘area’ (or directory), basename and extension respectively. If there was no extension specified in `{filename}`, `\filename@ext` should be `\let` to `\relax` (so this case may be tested with `\@ifundefined{filename@ext}` and, perhaps a default extension substituted).

Normally one would not need to define this macro in `texsys.cfg` as the automatic tests can supply parsers that work with UNIX and VMS and Macintosh syntax, as well as a basic parser that will cover many other cases. However some operating systems may need a ‘hand produced’ parser in which case it should be defined in this file.

The UNIX parser also works for most MSDOS T<sub>E</sub>X versions. Currently if the UNIX, VMS or Macintosh parser is not used, `\filename@parse` is defined to always return an empty area, and to split the argument into basename and extension at the first ‘.’ that occurs in the name. Parsers for other formats may be defined in `texsys.cfg`, in which case they will be used in preference to the default definitions.

`\@TeXversion`     `\@TeXversion` is now set automatically by the initialization tests in this file. You should not need to set it in `texsys.cfg`, however the following documentation is left for information. L<sup>A</sup>T<sub>E</sub>X does not set this variable exactly, the automatic tests set it to:

2 for any version,  $v$ ,  $v < 3.0$

3 for any version,  $v$ ,  $3.0 \leq v \leq 3.14$

*<undefined>* otherwise.

However these values are accurate enough for L<sup>A</sup>T<sub>E</sub>X to take appropriate action for these old T<sub>E</sub>Xs.

If your T<sub>E</sub>X is older than version 3.141, then you should define `\@TeXversion` (using `\def`) to be the version number. If you do not do this<sup>1</sup>, L<sup>A</sup>T<sub>E</sub>X will not work around a bug in old T<sub>E</sub>X versions, and so error messages will appear in a very strange format, with `^^J` appearing instead of line breaks:

```
LaTeX Error: \rubbish undefined.^^J^^JSee the LaTeX manual or LaTeX=
Companion
for explanation.^^JType  H <return>  for immediate help.
...

.3 \renewcommand{\rubbish}
      {}
```

However if you put `\def\@TeXversion{3.14}` in `texsys.cfg` the following format will be used:

```
LaTeX Error: \rubbish undefined.

ee the LaTeX manual or LaTeX Companion for explanation.
ype  H <return>  for immediate help.
.
...

.3 \renewcommand{\rubbish}
      {}
```

Note that this has an extra line ! . which does not appear in error messages that use the default settings with a current version of T<sub>E</sub>X, but this should not cause any confusion we hope.

## 2 Initialization

As this file is read at a very early stage, some definitions that are normally considered to be part of the format must be made here.

Most such definitions are repeated later in the “right” place, usually (but not always) with different implementations. To be able to spot this more easily if you look into the file `latex.ltx` (which is stripped of comments) we add some comment lines to that effect that survive the stripping process by `docstrip`.

```
1 <*dircheck>
2 %% ---- START temporary definitions for bootstrapping; later overwritten ----
3 </dircheck>
```

---

<sup>1</sup>Actually if your T<sub>E</sub>X is really old, version 2, L<sup>A</sup>T<sub>E</sub>X can detect this, and sets `\@TeXversion` to 2 if it is not set in the `cfg` file.

## 2.1 INITEX

```

4 <*dircheck>
5 <*initex>
6 <initex>\ifnum\catcode'\{=1
7 <initex> \errmessage
8 <initex> {LaTeX must be made using an initex with no format preloaded}
9 <initex>\fi
10 \catcode'\{=1
11 \catcode'\}=2

```

If LuaTeX is in use the extensions and other new primitives have to be activated: this is done as early as possible. Older versions of LuaTeX do not hide the primitives: a version check is not needed as the version itself will be missing in the case where action is needed!

```

12 \ifx\directlua\undefined
13 \else
14 \ifx\luatexversion\undefined

```

Enable e-TeX/pdfTeX/Umath primitives with their natural names

```

15 \directlua{tex.enableprimitives("",%
16 tex.extraprimitives('etex', 'pdftex', 'umath'))}

```

In current formats enable primitives with unprefix names. the `latexrelease` guards allow the primitives to be defined with a `\luatex` prefix if older formats are specified.

```

17 </initex>
18 </dircheck>
19 <*initex, latexrelease>
20 <latexrelease>\ifx\directlua\undefined\else
21 <latexrelease>\IncludeInRelease{2015/10/01}{\luatexluafunction}
22 <latexrelease> {LuaTeX (prefixed names)}%
23 \directlua{tex.enableprimitives("",%
24 tex.extraprimitives("omega", "aleph", "luatex"))}
25 <latexrelease>\EndIncludeInRelease
26 <latexrelease>\IncludeInRelease{0000/00/00}{\luatexluafunction}
27 <latexrelease> {LuaTeX (prefixed names)}%
28 <latexrelease>\directlua{
29 <latexrelease> tex.enableprimitives(
30 <latexrelease> "luatex",
31 <latexrelease> tex.extraprimitives("core","omega", "aleph", "luatex")
32 <latexrelease> )
33 <latexrelease> local i
34 <latexrelease> local t = { }
35 <latexrelease> for _,i in pairs(tex.extraprimitives("luatex")) do
36 <latexrelease> if not string.match(i,"^U") then
37 <latexrelease> if not string.match(i, "^luatex") then
38 <latexrelease> table.insert(t,i)
39 <latexrelease> end
40 <latexrelease> else
41 <latexrelease> if string.match(i,"^Uchar$") then
42 <latexrelease> table.insert(t,i)
43 <latexrelease> end
44 <latexrelease> end
45 <latexrelease> end
46 <latexrelease> for _,i in pairs(t) do
47 <latexrelease> tex.print(
48 <latexrelease> "\noexpand\\let\noexpand\\" .. i

```

```

49 <latexrelease>      .. "\noexpand\undefined"
50 <latexrelease>      )
51 <latexrelease> end
52 <latexrelease>}
53 <latexrelease>\EndIncludeInRelease
54 <latexrelease>\fi
55 </initex, latexrelease>
56 <*dircheck>
57 <*initex>
58   \fi
59 \fi

```

A test can now be made for eTeX.

```

60 <initex>\ifx\TeXversion\undefined
61 <initex> \errmessage
62 <initex>   {LaTeX requires e-TeX}
63 <initex> \expandafter\endinput
64 <initex>\fi

```

That distraction over, back to the basics of a format.

```

65 \catcode'\#=6
66 \catcode'\^=7
67 \chardef\active=13
68 \catcode'\@=11
69 \countdef\count@=255
70 \let\bgroup={ \let\egroup=}
71 \ifx@@input\@undefined\let@@input\input\fi
72 \ifx@@end\@undefined\let@@end\end\fi
73 \chardef\@inputcheck0
74 \chardef\sixt@@n=16
75 \newlinechar'\^^J
76 \def\typeout{\immediate\write17}
77 \def\dospecials{\do\ \do\\\do\{\do\}\do\$\do\&%
78   \do\#\do\^\do\_ \do\%\do\~}
79 \def\@makeother#1{\catcode'#1=12\relax}
80 \def\space{ }
81 \def\@tempswafalse{\let\if@tempswa\iffalse}
82 \def\@tempswatrue{\let\if@tempswa\iftrue}
83 \let\if@tempswa\iffalse
84 \def\loop#1\repeat{\def\iterate{#1\relax\expandafter\iterate\fi}%
85   \iterate \let\iterate\relax}
86 \let\repeat\fi
87 </initex>

```

## 2.2 Some bits of 2e

```

88 <*2ekernel>
89 \def\two@digits#1{\ifnum#1<10 0\fi\number#1}
90 \long\def\@firstoftwo#1#2{#1}
91 \long\def\@secondoftwo#1#2{#2}

```

This is a special version of \ProvidesFile for initex use.

```

92 \def\ProvidesFile#1{%
93   \begingroup
94   \catcode'\ 10 %
95   \ifnum \endlinechar<256 %

```

```

96      \ifnum \endlinechar>\m@ne
97      \catcode\endlinechar 10 %
98      \fi
99      \fi
100     \makeother\%
101     \ifnextchar[{\@providesfile{#1}}{\@providesfile{#1}[]}]
102 \def\@providesfile#1[#2]{%
103     \wlog{File: #1 #2}%
104     \@addtofilelist{ #2}%
105     \endgroup}
106 \long\def\@addtofilelist#1{}
107 \def\@empty{}
108 \catcode'\%=12
109 \def\@percentchar{%
110 \catcode'\%=14
111 \let\@currdir\@undefined
112 \let\input@path\@undefined
113 \let\filename@parse\@undefined

\strip@prefix

114 \def\strip@prefix#1>{}
115 </2ekernel>

(End definition for \strip@prefix.)

```

### 3 texsys.cfg

As mentioned above, any site specific definitions required to describe the filename handling must be entered into a file `texsys.cfg`. If `texsys.cfg` can not be located by `\openin`, we write a default version out. The default version only contains comments, so we do not actually input the file in that case. The automatic tests later will, hopefully, correctly define the required macros.

The tricky code below checks to see if `texsys.cfg` exists. If it does not, all the text in this file between START and END is copied verbatim to a new file `texsys.cfg`. If `texsys.cfg` is found, then it is simply input. This is only done when this file is being used unstripped.

```

116 <docstrip>
117 \openin15=texsys.cfg
118 \ifeof15
119 \typeout{** Writing a default texsys.cfg}
120 \immediate\openout15=texsys.cfg
121 \begingroup
122 \catcode'\^M\active%
123 \let^M\par%
124 \def\reserved@a#1^M{%
125     \def\reserved@b{#1}%
126     \ifx\reserved@b\reserved@c\endgroup\else%
127         \immediate\write15{#1}%
128         \expandafter\reserved@a\fi}%
129 \def\reserved@d#1START^M{\let\do\makeother\dospecials\reserved@a}%
130 \catcode'\%=12
131 \def\reserved@c{END}
132 \reserved@d

```

START

### 3.1 texsys.cfg

This file contains the site specific definitions of the four macros

`\@currdir`, `\input@path`, `\filename@parse` and `\@TeXversion`.

As distributed it only contains comments, however this ‘empty’ file will work on many systems because of the automatic tests built into `ltdirchk.dtx`. You *are* allowed to edit this file to add definitions of these macros appropriate to your system.

The macros that must be defined are:

`\@currdir` `\@currdir{filename}{space}` should expand to a form of the filename that uniquely refers to the ‘current directory’ if this is possible. (The expansion should also end with a space.) on UNIX, this is `\def\@currdir{./}`. For more exotic operating systems you may want to make `\@currdir` a macro with arguments delimited by `.` and/or `{space}`. If the operating system has no concept of directory structure, this macro should be defined to be empty.

`\input@path` If the primitive `\openin` searches the same directories as the primitive `\input`, then it is possible to tell (using `\ifeof`) whether a file exists before trying to input it. For systems like this, `\input@path` should be left undefined.

If `\openin` does not ‘follow’ `\input` then `\input@path` must be defined to be a list of directories to search for input files. The format for each directory is as for `\@currdir`, normally just a prefix is required, but it may be a macro with space-delimited argument. That is, if `<dir>` is an entry in the input path,  $\TeX$  will try to load the expansion of

`<dir>{filename}{space}`

So either `<dir>` should be defined as a macro with argument delimited by space, or it should just expand to a directory name, including the final directory separator, so that it may be concatenated with the `<filename>`. This means that for UNIX-like syntax, each `<dir>` should end with a slash, `/`. One exception to this rule is that the input path should *always* contain the empty directory `{}` as this will allow ‘full pathnames’ to be used, and the ‘current directory’ to be searched.

`\input@path` should expand to a list of such directories, each in a `{}` group.

`\filename@parse` After a call of the form: `\filename@parse{filename}`, the three macros `\filename@area`, `\filename@base`, `\filename@ext` should be defined to be the ‘area’ (or directory), basename and extension respectively. If there was no extension specified in `<filename>`, `\filename@ext` should be `\let` to `\relax` (so this case may be tested with `\@ifundefined{filename@ext}` and, perhaps a default extension substituted).

Normally one would not need to define this macro in `texsys.cfg` as the automatic tests can supply parsers that work with UNIX and VMS syntax, as well as a basic parser that will cover many other cases. However some operating systems may need a ‘hand produced’ parser in which case it should be defined in this file.

The UNIX parser also works for most MSDOS  $\TeX$  versions. Currently if the UNIX or VMS parser is not used, `\filename@parse` is defined to always return an empty area, and to split the argument into basename and extension at the first ‘.’ that occurs in the name. Parsers for other formats may be defined in `texsys.cfg`, in which case they will be used in preference to the default definitions.

`\@TeXversion` You should not need to set this macro in `texsys.cfg`.  $\LaTeX$  tests to set this automatically. See the comments in the opening section of `ltdirchk.dtx`.

The following sections give examples of definitions which might work on various systems. These are currently mainly untested as I only have access to a few systems, all

of which do not need this file as the automatic tests work. All the code is commented out.

### 3.2 UNIX (web2c)

This implementation does make `\openin` and `\input` look in the same places. Acceptable settings are made by `ltdirchk.dtx`, and so this file may be empty. The definitions below are therefore just for information.

```
133 % \def\@currdir{./}
134 % \let\input@path\@undefined
```

### 3.3 UNIX (other)

Apparently some commercial UNIX implementations have different paths for `\openin` and `\input`. For these one could use definitions like the following (with whatever directories are used at your site): note that the directory names should end with `/`.

```
135 % \def\@currdir{./}
136 % \def\input@path{%
137 %   {usr/local/lib/tex/inputs/distrib}/%
138 %   {usr/local/lib/tex/inputs/contrib}/%
139 %   {usr/local/lib/tex/inputs/local}/%
140 % }
```

### 3.4 MSDOS (emtex)

This implementation does make `\openin` and `\input` look in the same places. Acceptable settings are made by `ltdirchk.dtx`, and so this file may be empty. The definitions below are therefore just for information.

```
141 % \def\@currdir{./}
142 % \let\input@path\@undefined
```

### 3.5 MSDOS (other)

Some PC implementations have different paths for `\openin` and `\input`. For these one could use definitions like the following (with whatever directories are used at your site): note that the directory names should end with `/`. This assumes the implementation uses UNIX style `/` as the directory separator.

```
143 % \def\@currdir{./}
144 % \def\input@path{%
145 %   {c:/tex/inputs/distrib}/%
146 %   {c:/tex/inputs/contrib}/%
147 %   {c:/tex/inputs/local}/%
148 % }
```

### 3.6 VMS (DECUS T<sub>E</sub>X, PD VMS 3.6)

This implementation does make `\openin` and `\input` look in the same places. Acceptable settings are made by `ltdirchk.dtx`, and so this file may be empty. The definitions below are therefore just for information.

```
149 % \def\@currdir{[] }
150 % \let\input@path\@undefined
```

### 3.7 VMS (???)

Some VMS implementations have different paths for `\openin` and `\input`. For these one could use definitions like the following:

```
151 % \def\currdir{[]}  
152 % \def\input@path{%  
153 %   {tex_inputs:}%  
154 %   {SOMEDISK:[SOME.TEX.DIRECTORY]}%  
155 % }
```

### 3.8 MACINTOSH (OzTeX 1.6)

This implementation does make `\openin` and `\input` look in the same places. Acceptable settings are made by `ltdirchk.dtx`, and so this file may be empty. The definitions below are therefore just for information.

```
156 % \def\currdir{:}  
157 % \let\input@path\undefined
```

### 3.9 MACINTOSH (other)

Some Macintosh implementations have different paths for `\openin` and `\input`. For these one could use definitions like the following (with whatever folders are used on your machine): note that the directory names should end with `:`, and they should contain *no* spaces.

```
158 % \def\currdir{:}  
159 % \def\input@path{%  
160 %   {Hard-Disk:Applications:TeX:TeX-inputs:}%  
161 %   {Hard-Disk:Applications:TeX:My-inputs:}%  
162 % }
```

### 3.10 FAKE EXAMPLE

This example is for an operating system that has filenames of the form `<area>name`. For maximum compatibility with macro sets, you want `name.ext` to be mapped to `<ext>name`. and `<area>name.ext` to be mapped to `<area.ext>name`. `\input` does this mapping automatically, but `\openin` does not, and does not look in the same places as `\input`. `<>name` is the desired ‘current directory’ syntax.

the following code would possibly work:

```
163 % \def\@dir#1#2 {%  
164 %   \@d@r{#1}#2..\@nil}  
165 % \def\@d@r#1#2.#3.#4\@nil{%  
166 %   <\ifx\@dir#1\@dir\else#1\ifx\@dir#3\@dir\else.\fi\fi#3>#2 }  
167 %  
168 % \def\currdir{\@dir{}}  
169 % \def\input@path{%  
170 %   {\@dir{area.one}}%  
171 %   {\@dir{area.two}}%  
172 % }
```

END

```
173 \immediate\closeout15
```



If `texsys.cfg` did exist, then input it.

```

174 \else
175 \typeout{** Using the existing texsys.cfg}
176 \closein15
177 \input texsys.cfg
178 \fi
179 \</docstrip>

```

If the stripped version of this file is being used (in `latex2e.ltx`) then `texsys.cfg` should be there, so just input it.

```

180 \dircheck\input texsys.cfg

```

## 4 Setting `\@currdir`

`\@currdir` This is a local definition of `\IfFileExists`. It tries to relocate `texsys.aux`. If it succeeds, then the `\@currdir` syntax has been determined. If all the tests fail then `\@currdir` will be set to `\@empty`, and `ltxcheck` will warn of this when it checks the format.

```

181 \begingroup
182 \count@ \time
183 \divide \count@ 60
184 \count2 = - \count@
185 \multiply \count2 60
186 \advance \count2 \time

```

The current date and time stamp.

```

187 \edef \today {%
\today 188 \the year / \two@digits { \the month } / \two@digits { \the day } : %
189 \two@digits { \the count@ } : \two@digits { \the count2 } }

```

Create a file `texsys.aux` (hopefully in the current directory), then try to locate it again.

```

190 \immediate \openout15 = texsys.aux
191 \immediate \write15 { \today ^ ^ J }
192 \immediate \closeout15 %

```

`#1` is the file to try, `#2` is what to do on success, `#3` on failure. Note that this definition is overwritten later on again!

```

193 \def \IfFileExists #1 #2 #3 { %
194 \openin \@inputcheck #1 %
195 \ifeof \@inputcheck
196 #3 \relax
197 \else
198 \read \@inputcheck to \reserved@a
199 \ifx \reserved@a \today
200 \typeout { #1 found } #2 \relax
201 \else
202 \typeout { BAD: old file \reserved@a (should be \today) } %
203 #3 \relax
204 \fi
205 \fi
206 \closein \@inputcheck }

```

```
207 \endlinechar=-1
```

If `\@currdir` has not been pre-defined in `texsys.cfg` then test for UNIX, VMS and Oz-TeX-Mac. syntax.

```
208 \ifx\@currdir\undefined
209   \IfFileExists{./texsys.aux}{\gdef\@currdir{.}}%
210   {\IfFileExists{[]texsys.aux}{\gdef\@currdir{[]}}%
211   {\IfFileExists{:texsys.aux}{\gdef\@currdir{:}}{}}}
```

If it is still undefined at this point, all the above tests failed. Earlier versions interactively prompted for a definition at this point, but it seems impossible to reliably obtain information from users at this point in the installation. This version of the file produces a format with no user-interaction. Later if the format is not suitable for the system, `texsys.cfg` may be edited and the format re-made.

```
212 \ifx\@currdir\undefined
213   \global\let\@currdir\empty
214   \typeout{^^J^^J%
215   !! No syntax for the current directory could be found^^J%
216   }%
217 \fi
```

Otherwise `\@currdir` was defined in `texsys.cfg`. In this case check that the syntax specified works on this system. (In case a complete L<sup>A</sup>T<sub>E</sub>X system has been copied from one system to another.) If the test fails, give up. The installer should remove or correct the offending `texsys.cfg` and try again.

```
218 \else
219   \IfFileExists{\@currdir texsys.aux}{}{%
220     \edef\reserved@a{\errhelp{%
221       texsys.cfg specifies the current directory syntax to be^^J%
222       \meaning\@currdir^^J%
223       but this does not work on this system.^^J%
224       Remove texsys.cfg and restart.}}\reserved@a
225     \errmessage{Bad texsys.cfg file: \noexpand\@currdir}\@@end}
```

The version of `\@currdir` in `texsys.cfg` looks OK.

```
226 \fi

227 \immediate\closeout15 %
228 \endgroup

229 \typeout{^^J^^J%
230   \noexpand\@currdir set to:
231   \expandafter\strip@prefix\meaning\@currdir.^^J%
232   }
```

(End definition for `\@currdir`, `\IfFileExists`, and `\today`.)

Stop here if the file is being used unstripped.

```
233 <*docstrip>
234 \relax\endinput
235 </docstrip>
```

## 5 Setting \input@path

Earlier versions of this file attempted to automatically test whether \input@path was required, and interactively prompt for a path if necessary. This was not found to be very reliable. The first-time installer of L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> can not be expected to have enough information to supply the correct information to the prompts. Now the interaction is omitted. After the format is made the installer can attempt to run the test document `ltxcheck.tex` through L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>. This will check, among other things, whether `texsys.cfg` will need to be edited and the format remade.

\input@path Now set up the \input@path.

\input@path should either be undefined, or a list of directories as described in the introduction.

```
236 \typeout{^^J%
237   Assuming \noexpand\openin and \noexpand\input^^J%
238   \ifx\input@path\@undefined
\input@path has not been pre-defined.
239     have the same search path.^^J%
240   \else
\input@path has been defined in texsys.cfg.
241     have different search paths.^^J%
242     LaTeX will use the path specified by \noexpand\input@path:^^J%
243   \fi
244 }
```

(End definition for \input@path.)

## 6 Filename Parsing

\filename@parse Split a filename into its components.

```
245 \ifx\filename@parse\@undefined
246   \def\reserved@a{.}\ifx\@currdir\reserved@a
\filename@parse was not specified in texsys.cfg, but \@currdir looks like UNIX...
247   \typeout{^^JDefining UNIX/DOS style filename parser.^^J}
248   \def\filename@parse#1{%
249     \let\filename@area\@empty
250     \expandafter\filename@path#1/\}
Search for the last /.
251   \def\filename@path#1/#2\{#1%
252     \ifx\#2\%
253       \def\reserved@a{\filename@simple#1.\}%
254     \else
255       \edef\filename@area{\filename@area#1/}%
256       \def\reserved@a{\filename@path#2\}%
257     \fi
258     \reserved@a}
259   \else\def\reserved@a{[]}\ifx\@currdir\reserved@a
```

\filename@parse was not specified in texsys.cfg, but \@currdir looks like VMS...

```

260 \typeout{^^JDefining VMS style filename parser.^^J}
261 \def\filename@parse#1{%
262   \let\filename@area\@empty
263   \expandafter\filename@path#1\}

```

Search for the last ].

```

264 \def\filename@path#1#2\{%
265   \ifx\#2\%
266     \def\reserved@a{\filename@simple#1.\}%
267   \else
268     \edef\filename@area{\filename@area#1}%
269     \def\reserved@a{\filename@path#2\}%
270   \fi
271   \reserved@a}
272 \else\def\reserved@a{:}\ifx\@currdir\reserved@a

```

\filename@parse was not specified in texsys.cfg, but \@currdir looks like Macintosh...

```

273 \typeout{^^JDefining Mac style filename parser.^^J}
274 \def\filename@parse#1{%
275   \let\filename@area\@empty
276   \expandafter\filename@path#1\}

```

Search for the last :.

```

277 \def\filename@path#1#2\{%
278   \ifx\#2\%
279     \def\reserved@a{\filename@simple#1.\}%
280   \else
281     \edef\filename@area{\filename@area#1}%
282     \def\reserved@a{\filename@path#2\}%
283   \fi
284   \reserved@a}
285 \else

```

\filename@parse was not specified in texsys.cfg. So just make a simple parser that always sets \filename@area to empty.

```

286 \typeout{^^JDefining generic filename parser.^^J}
287 \def\filename@parse#1{%
288   \let\filename@area\@empty
289   \expandafter\filename@simple#1.\}
290 \fi\fi\fi

```

\filename@simple is used by all three versions. Finally we can split off the extension.

```

291 </dircheck>
292 <*dircheck, latexrelease>
293 <latexrelease>\IncludeInRelease{2019/10/01}{\filename@simple}
294 <latexrelease>{Final dot for extension}%
295 \def\filename@simple#1.#2\{%
296   \ifx\#2\%
297     \let\filename@ext\relax
298     \edef\filename@base{#1}%
299   \else

```

```

300     \filename@dots{#1}#2\\%
301     \fi}
302 \def\filename@dots#1#2.#3\\{%
303     \ifx\\#3\\%
304         \def\filename@ext{#2}%
305         \edef\filename@base{#1}%
306     \else
307         \filename@dots{#1.#2}#3\\%
308     \fi}
309 \langle latexrelease \rangle \EndIncludeInRelease
310 \langle latexrelease \rangle \IncludeInRelease{0000/00/00}{\filename@simple}
311 \langle latexrelease \rangle {Final dot for extension}%
312 \langle latexrelease \rangle \def\filename@simple#1.#2\\{%
313 \langle latexrelease \rangle     \ifx\\#2\\%
314 \langle latexrelease \rangle     \let\filename@ext\relax
315 \langle latexrelease \rangle     \else
316 \langle latexrelease \rangle     \edef\filename@ext{\filename@dot#2\\}%
317 \langle latexrelease \rangle     \fi
318 \langle latexrelease \rangle     \edef\filename@base{#1}}
319 \langle latexrelease \rangle \EndIncludeInRelease
320 \langle /dircheck, latexrelease \rangle
321 \langle *dircheck \rangle

    Remove a final dot, added earlier.
322     \def\filename@dot#1.\\{#1}
323 \else

```

Otherwise, \filename@parse was specified in texsys.cfg.

```

324     \typeout{^^J^^J%
325         \noexpand\filename@parse was defined in texsys.cfg:^^J%
326         \expandafter\strip@prefix\meaning\filename@parse.^^J%
327     }
328 \fi

```

(End definition for \filename@parse.)

## 7 T<sub>E</sub>X Versions

\@TeXversion T<sub>E</sub>X versions older than 3.141 require \@TeXversion to be set. This can be determined automatically due to a trick suggested by Bernd Raichle. (Actually this will not always get the correct version number, eg T<sub>E</sub>X3.14 would be detected as T<sub>E</sub>X3, but L<sup>A</sup>T<sub>E</sub>X only needs to take account of T<sub>E</sub>X's older than 3, or between 3 and 3.14.

```

329 \ifx\@TeXversion\undefined
330     \ifx\@undefined\inputlineno
331         \def\@TeXversion{2}
332     \else
333         {\catcode'\^^J=\active
334         \def\reserved@a#1#2\@{\if#1\string~3\fi}
335         \edef\reserved@a{\expandafter\reserved@a\string^^J\@}
336         \ifx\reserved@a\@empty\else\gdef\@TeXversion{3}\fi}
337     \fi
338 \fi

```

*(End definition for \@TeXversion.)*

```
339 %% ---- END temporary definitions for bootstrapping ----  
340 </dircheck>
```

## 8 ltxcheck.tex

After the format has been made, and `article.cls` moved with the other files to the ‘standard input directory’ as specified in `install.txt`, the format may be checked by running the file `ltxcheck.tex`.

# File b

## lplain.dtx

### 1 Plain T<sub>E</sub>X

L<sup>A</sup>T<sub>E</sub>X includes almost all of the functionality of Knuth's original 'Basic Macros' That is, the plain T<sub>E</sub>X format described in Appendix B of the T<sub>E</sub>XBook. However, some of the user commands are not much use so, in order to save memory, we may remove them from the kernel into a package. Here is a list of the commands that may be removed (PROBABLY NOT COMPLETE).

```
\magstep      \magstephalf
\mathhexbox
\vglue        \vgl@
\hglue        \hgl@
```

This file is by now very small as most of it has been moved to more appropriate kernel files: it may disappear completely one day.

L<sup>A</sup>T<sub>E</sub>X font definitions are done using NFSS2 so none of PLAIN's font definitions are in L<sup>A</sup>T<sub>E</sub>X.

L<sup>A</sup>T<sub>E</sub>X has its own tabbing environment, so PLAIN's is disabled.

L<sup>A</sup>T<sub>E</sub>X uses its own output routine, so most of the plain one was removed.

```
1 (*2kernel)
2 \catcode'\{=1 % left brace is begin-group character
3 \catcode'\}=2 % right brace is end-group character
4 \catcode'\$=3 % dollar sign is math shift
5 \catcode'\&=4 % ampersand is alignment tab
6 \catcode'\#=6 % hash mark is macro parameter character
7 \catcode'\^=7 % circumflex and uparrow are for superscripts
8 \catcode'\_ =8 % underline and downarrow are for subscripts
9 \catcode'\^~I=10 % ascii tab is a blank space
10 \chardef\active=13 \catcode'\~=\active % tilde is active
11 \catcode'\^~L=\active \def^~L{\par}% ascii form-feed is \par
12 \message{catcodes,}
```

We had to define the \catcodes right away, before the message line, since \message uses the { and } characters. When INITEX (the T<sub>E</sub>X initializer) starts up, it has defined the following \catcode values:

```
\catcode'\^~@=9 %  ascii null is ignored
\catcode'\^~M=5 %  ascii return is end-line
\catcode'\ =0 %    backslash is TeX escape character
\catcode'\%=14 %   percent sign is comment character
\catcode'\ =10 %   ascii space is blank space
\catcode'\^~?=15 %  ascii delete is invalid
\catcode'\A=11 ... \catcode'\Z=11 % uppercase letters
\catcode'\a=11 ... \catcode'\z=11 % lowercase letters
all others are type 12 (other)
```

Here is a list of the characters that have been specially catcoded:

```
13 \def\dospecials{\do\ \do\\\do\{\do\}\do\$ \do\&%
14 \do\# \do\^ \do\_ \do\% \do\~}
```

(not counting ascii null, tab, linefeed, formfeed, return, delete) Each symbol in the list is preceded by , which can be defined if you want to do something to every item in the list.

We make @ signs act like letters, temporarily, to avoid conflict between user names and internal control sequences of plain format.

```
15 \catcode'\@=11
```

To make the plain macros more efficient in time and space, several constant values are declared here as control sequences. If they were changed, anything could happen; so they are private symbols.

```
\@ne Small constants are defined using \chardef.
\tw@ 16 \chardef\@ne=1
\thr@@ 17 \chardef\tw@=2
\sixt@@n 18 \chardef\thr@@=3
\@cclv 19 \chardef\sixt@@n=16
        20 \chardef\@cclv=255

(End definition for \@ne and others.)
```

```
\@cclvi Constants above 255 defined using \mathchardef.
\@m 21 \mathchardef\@cclvi=256
\@M 22 \mathchardef\@m=1000
\@MM 23 \mathchardef\@M=10000
      24 \mathchardef\@MM=20000

(End definition for \@cclvi and others.)
```

Allocation of registers

Here are macros for the automatic allocation of \count, \box, \dimen, \skip, \muskip, and \toks registers, as well as \read and \write stream numbers, \fam codes, \language codes, and \insert numbers.

```
25 \message{registers,}
```

When a register is used only temporarily, it need not be allocated; grouping can be used, making the value previously in the register return after the close of the group. The main use of these macros is for registers that are defined by one macro and used by others, possibly at different nesting levels. All such registers should be defined through these macros; otherwise conflicts may occur, especially when two or more macro packages are being used at the same time.

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

The following counters are reserved:

- 0 to 9 page numbering
- 10 count allocation
- 11 dimen allocation
- 12 skip allocation
- 13 muskip allocation
- 14 box allocation
- 15 toks allocation
- 16 read file allocation
- 17 write file allocation
- 18 math family allocation
- 19 language allocation
- 20 insert allocation
- 21 the most recently allocated number



22 constant -1

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

New counters are allocated starting with 23, 24, etc. Other registers are allocated starting with 10. This leaves 0 through 9 for the user to play with safely, except that counts 0 to 9 are considered to be the page and subpage numbers (since they are displayed during output). In this scheme, `\count 10` always contains the number of the highest-numbered counter that has been allocated, `\count 14` the highest-numbered box, etc. Inserts are given numbers 254, 253, etc., since they require a `\count`, `\dimen`, `\skip`, and `\box` all with the same number; `\count 20` contains the lowest-numbered insert that has been allocated. Of course, `\box255` is reserved for `\output`; `\count255`, `\dimen255`, and `\skip255` can be used freely.

It is recommended that macro designers always use `\global` assignments with respect to registers numbered

1, 3, 5, 7, 9,

and always non-`\global` assignments with respect to registers

0, 2, 4, 6, 8, 255.

This will prevent “save stack buildup” that might otherwise occur.

```
26 \count10=22 % allocates \count registers 23, 24, ...
27 \count11=9 % allocates \dimen registers 10, 11, ...
28 \count12=9 % allocates \skip registers 10, 11, ...
29 \count13=9 % allocates \muskip registers 10, 11, ...
30 \count14=9 % allocates \box registers 10, 11, ...
31 \count15=9 % allocates \toks registers 10, 11, ...
32 \count16=-1 % allocates input streams 0, 1, ...
33 \count17=-1 % allocates output streams 0, 1, ...
34 \count18=3 % allocates math families 4, 5, ...
35 \count19=0 % allocates \language codes 1, 2, ...
36 \count20=255 % allocates insertions 254, 253, ...
```

```
\insc@unt The insertion counter and most recent allocation.
\allocationnumber
37 \countdef\insc@unt=20
38 \countdef\allocationnumber=21
```

*(End definition for \insc@unt and \allocationnumber.)*

```
\m@ne The constant -1.
39 \countdef\m@ne=22 \m@ne=-1
```

*(End definition for \m@ne.)*

```
\wlog Write on log file (only)
40 \def\wlog{\immediate\write\m@ne}
```

*(End definition for \wlog.)*

```
\count@ Here are abbreviations for the names of scratch registers that don't need to be allocated.
\dimen@ 41 \countdef\count@=255
\dimen@i 42 \dimendef\dimen@=0
\dimen@ii 43 \dimendef\dimen@i=1 % global only
\skip@ 44 \dimendef\dimen@ii=2
\toks@ 45 \skipdef\skip@=0
46 \toksdef\toks@=0
```

(End definition for \count@ and others.)

```

\newcount Now, we define \newcount, \newbox, etc. so that you can say \newcount\foo and \foo
\newdimen will be defined (with \countdef) to be the next counter.
\newskip To find out which counter \foo is, you can look at \allocationnumber.
\newmuskip Since there's no \boxdef command, \chardef is used to define a \newbox,
\newbox \newinsert, \newfam, and so on.
\newtoks LATEX change: remove \outer from \newcount and \newdimen (FMi) This is nec-
\newread essary to use \newcount inside \if... later on. Also remove from \newskip, \newbox
\newwrite \newwrite and \newfam (DPC) to save later redefinition.
\newfam
\newlanguage
47 </2ekernel>
48 <*2ekernel|latexrelease>
49 <latexrelease>\IncludeInRelease{2015/01/01}%
50 <latexrelease> {\newcount}{Extended Allocation}%

51 \def\newcount {\e@alloc\count \countdef {\count10}\insc@unt\float@count}
52 \def\newdimen {\e@alloc\dimen \dimendef {\count11}\insc@unt\float@count}
53 \def\newskip {\e@alloc\skip \skipdef {\count12}\insc@unt\float@count}
54 \def\newmuskip
55 {\e@alloc\muskip\muskipdef{\count13}\m@ne\e@alloc@top}

For compatibility use \chardef in the classical range.

56 \def\newbox {\e@alloc\box
57 {\ifnum\allocationnumber<\cclvi
58 \expandafter\chardef
59 \else
60 \expandafter\e@alloc@chardef
61 \fi}
62 {\count14}\insc@unt\float@count}
63 \def\newtoks {\e@alloc\toks \toksdef{\count15}\m@ne\e@alloc@top}
64 \def\newread {\e@alloc\read \chardef{\count16}\m@ne\sixt@n}

Skip \write18 due to its traditional use as a shell-escape.

65 \ifx\directlua\@undefined
66 \def\newwrite {\e@alloc\write \chardef{\count17}\m@ne\sixt@n}
67 \else
68 \def\newwrite {\e@alloc\write
69 {\ifnum\allocationnumber=18
70 \advance\count17\@ne
71 \allocationnumber\count17 %
72 \fi
73 \global\chardef}%
74 {\count17}%
75 \m@ne
76 {128}}
77 \fi

78 \def\new@mathgroup
79 {\e@alloc\mathgroup\chardef{\count18}\m@ne\e@mathgroup@top}
80 \let\newfam\new@mathgroup

81 \ifx\directlua\@undefined
82 \def\newlanguage {\e@alloc\language \chardef{\count19}\m@ne\cclvi}
83 \else
84 \def\newlanguage {\e@alloc\language \chardef{\count19}\m@ne{16384}}

```

```

85 \fi
86 </2ekernel | latexrelease>
87 <latexrelease>\EndIncludeInRelease
88 <latexrelease>\IncludeInRelease{0000/00/00}%
89 <latexrelease>          {\newcount}{Extended Allocation}%
90 <latexrelease>\def\newcount{\alloc@0\count\countdef\insc@unt}
91 <latexrelease>\def\newdimen{\alloc@1\dimen\dimendef\insc@unt}
92 <latexrelease>\def\newskip{\alloc@2\skip\skipdef\insc@unt}
93 <latexrelease>\def\newmuskip{\alloc@3\muskip\muskipdef\@cclvi}
94 <latexrelease>\def\newbox{\alloc@4\box\chardef\insc@unt}
95 <latexrelease>\def\newtoks{\alloc@5\toks\toksdef\@cclvi}
96 <latexrelease>\def\newread{\alloc@6\read\chardef\sixt@@n}
97 <latexrelease>\def\newwrite{\alloc@7\write\chardef\sixt@@n}
98 <latexrelease>\def\new@mathgroup{\alloc@8\fam\chardef\sixt@@n}
99 <latexrelease>\def\newlanguage{\alloc@9\language\chardef\@cclvi}
100 <latexrelease>\let\newfam\new@mathgroup
101 <latexrelease>\EndIncludeInRelease

```

*(End definition for \newcount and others.)*

`\e@alloc@chardef` The upper limit of extended registers, which leaves this number (eg `\dimen32767`) always  
`\e@alloc@top` unallocated by these macros. cf traditional `\dimen255`.

```

102 <*2ekernel | latexrelease>
103 <latexrelease>\IncludeInRelease{2015/01/01}%
104 <latexrelease>          {\e@alloc@chardef}{Extended Allocation}%

```

```

105 \ifx\directlua\undefined
106   \ifx\widowpenalties\undefined

```

classic tex has  $2^8$  registers.

```

107   \mathchardef\e@alloc@top=255
108   \let\e@alloc@chardef\chardef
109   \else

```

etex and xetex have  $2^{15}$  registers.

```

110   \mathchardef\e@alloc@top=32767
111   \let\e@alloc@chardef\mathchardef
112   \fi
113 \else

```

luatex has  $2^{16}$  registers.

```

114   \chardef\e@alloc@top=65535
115   \let\e@alloc@chardef\chardef
116 \fi
117 </2ekernel | latexrelease>
118 <latexrelease>\EndIncludeInRelease
119 <latexrelease>\IncludeInRelease{0000/00/00}%
120 <latexrelease>          {\e@alloc@chardef}{Extended Allocation}%
121 <latexrelease>\let\e@alloc@top\undefined
122 <latexrelease>\let\e@alloc@chardef\undefined
123 <latexrelease>\EndIncludeInRelease

```

*(End definition for \e@alloc@chardef and \e@alloc@top.)*

`\e@mathgroup@top` The upper limit of extended math groups (`\fam`) 16 in classic T<sub>E</sub>X and e-T<sub>E</sub>X, but 256 in Unicode TeX variants.

```

124 <*2ekernel | latexrelease>
125 <latexrelease>\IncludeInRelease{2015/01/01}%
126 <latexrelease>                                {\e@mathgroup@top}{Extended Allocation}%
127 \ifx\Umathcode\@undefined
classic and e tex have 16 fam (0–15).
128   \chardef\e@mathgroup@top=16
129   \else
xetex and luatex have 256 fam (0–255).
130   \chardef\e@mathgroup@top=256
131   \fi
132 </2ekernel | latexrelease>
133 <latexrelease>\EndIncludeInRelease
134 <latexrelease>\IncludeInRelease{0000/00/00}%
135 <latexrelease>                                {\e@mathgroup@top}{Extended Allocation}%
136 <latexrelease>\let\e@mathgroup@top\@undefined
137 <latexrelease>\EndIncludeInRelease

```

*(End definition for \e@mathgroup@top.)*

`\e@alloc` A modified version of `\alloc@` that takes the count register rather than just the final digit of its number (assuming `\count1x`). It also has an extra argument to give the top of the extended range.

```

#1 #2 #3 #4 #5 #6
\e@alloc type defcmd current top extended-top newname
Note that if just a single allocation range is required (not omitting a range up to
255 for inserts) then −1 should be used for the first upper bound argument, #4.
138 <*2ekernel | latexrelease>
139 <latexrelease>\IncludeInRelease{2015/01/01}{\e@alloc}{Extended Allocation}%
140 \def\e@alloc#1#2#3#4#5#6{%
141   \global\advance#3\@ne
142   \e@ch@ck{#3}{#4}{#5}#1%
143   \allocationnumber#3\relax
144   \global#2#6\allocationnumber
145   \wlog{\string#6=\string#1\the\allocationnumber}}%
146 </2ekernel | latexrelease>
147 <latexrelease>\EndIncludeInRelease
148 <latexrelease>\IncludeInRelease{0000/00/00}{\e@alloc}{Extended Allocation}%
149 <latexrelease>\let\e@alloc\@undefined
150 <latexrelease>\EndIncludeInRelease
151 <*2ekernel>

```

*(End definition for \e@alloc.)*

`\e@ch@ck` Extended check command. If the first range is exceeded, bump to 256 (or 266 for counts) and try again, testing the extended range.

Allocate matching registers from the top of the extended range and add to \@freelist.

```

\extrafloats 152 </2kernel>
153 <*2kernel | latexrelease>
154 <latexrelease> \IncludeInRelease{2015/10/01}
155 <latexrelease> { \e@ch@ck } { Extended Allocation (checking) } %

156 \gdef \e@ch@ck#1#2#3#4{%
157   \ifnum#1<#2\else

      If we've reached the classical top limit, bump to 256 or 266 for counts (count 256–265
      are reserved by the allocation system).

158     \ifnum#1=#2\relax
159       \global#1\@cclvi
160       \ifx\count#4\global\advance#1 10 \fi
161     \fi

      Check we are below the extended limit.

162     \ifnum#1<#3\relax
163     \else
164       \errmessage{No room for a new \string#4}%
165     \fi
166   \fi}%
167 <latexrelease> \EndIncludeInRelease
168 <latexrelease> \IncludeInRelease{2015/01/01}%
169 <latexrelease> { \e@ch@ck } { Extended Allocation (checking) } %
170 <latexrelease> \gdef \e@ch@ck#1#2#3#4{%
171 <latexrelease>   \ifnum#1<#2\else
172 <latexrelease>     \ifnum#1=#2\relax
173 <latexrelease>       #1\@cclvi
174 <latexrelease>       \ifx\count#4\advance#1 10 \fi
175 <latexrelease>     \fi
176 <latexrelease>     \ifnum#1<#3\relax
177 <latexrelease>     \else
178 <latexrelease>       \errmessage{No room for a new #4}%
179 <latexrelease>     \fi
180 <latexrelease>   \fi}%
181 <latexrelease> \EndIncludeInRelease
182 <latexrelease> \IncludeInRelease{0000/00/00}%
183 <latexrelease> { \e@ch@ck } { Extended Allocation (checking) } %
184 <latexrelease> \let \e@ch@ck \@undefined
185 <latexrelease> \EndIncludeInRelease

186 <latexrelease> \IncludeInRelease{2015/01/01}%
187 <latexrelease> { \extrafloats } { Extra floats } %

188 \let \float@count \e@alloc@top

\extrafloats 189 \ifx\numexpr\@undefined

      In classic TeX use \newinsert to allocate float boxes.

190 \def\extrafloats#1{%
191   \count@#1\relax
192   \ifnum\count@>\z@
193     \newinsert\reserved@a
194     \global\expandafter\chardef

```

```

195         \csname bx@\the\allocationnumber\endcsname\allocationnumber
196 \@cons\@freelist{\csname bx@\the\allocationnumber\endcsname}%
197 \advance\count@m@ne
198 \expandafter\extrafloats
199 \expandafter\count@
200 \fi
201 }%
202 \else

```

In e-tex take float boxes from the top of the extended range.

```

203 \def\extrafloats#1{%
204 \ifnum#1>\z@
205 \count@\numexpr\float@count-1\relax
206 \ch@ck0\count@\count
207 \ch@ck1\count@\dimen
208 \ch@ck2\count@\skip
209 \ch@ck4\count@\box
210 \global\@alloc@chardef\float@count\count@
211 \global\expandafter\@alloc@chardef
212         \csname bx@\the\float@count\endcsname\float@count
213 \@cons\@freelist{\csname bx@\the\float@count\endcsname}%
214 \expandafter
215 \extrafloats\expandafter{\numexpr#1-1\relax}%
216 \fi}%
217 \fi
218 </2ekernel | latexrelease>
219 <latexrelease>\EndIncludeInRelease
220 <latexrelease>\IncludeInRelease{0000/00/00}%
221 <latexrelease>         {\extrafloats}{Extra floats}%
222 <latexrelease>\let\float@count\@undefined
223 <latexrelease>\let\extrafloats\@undefined
224 <latexrelease>\EndIncludeInRelease
225 <*2ekernel>

```

*(End definition for \e@ch@ck, \extrafloats, and \extrafloats.)*

**\alloc@** Since \e@alloc was added in 2015, \@alloc has not been used, but was left as some legacy code calls it. However the original definition gives spurious errors once the “classic” registers run out, so it is now defined to call \e@alloc internally.

```

226 </2ekernel>
227 <*2ekernel | latexrelease>
228 <latexrelease>\IncludeInRelease{2020/10/01}
229 <latexrelease>         {\alloc@}{emulate alloc@}%
230 \def\alloc@#1#2#3#4{\e@alloc#2#3{\count1#1}#4\float@count}
231 </2ekernel | latexrelease>
232 <latexrelease>\EndIncludeInRelease
233 <latexrelease>\IncludeInRelease{0000/00/00}%
234 <latexrelease>         {\alloc@}{emulate alloc@}%
235 <latexrelease>\def\alloc@#1#2#3#4#5{\global\advance\count1#1\@ne
236 <latexrelease> \ch@ck#1#4#2%
237 <latexrelease> \allocationnumber\count1#1%
238 <latexrelease> \global#3#5\allocationnumber
239 <latexrelease> \wlog{\string#5=\string#2\the\allocationnumber}}

```

```

240 <latexrelease>\EndIncludeInRelease
241 <*2ekernel>

```

(End definition for \alloc@.)

**\newinsert**

```

242 </2ekernel>
243 <*2ekernel | latexrelease>
244 <latexrelease>\IncludeInRelease{2015/10/01}
245 <latexrelease>{\newinsert}{Extended \newinsert}%
246 \ifx\numexpr\@undefined

```

If e-TeX is not available use the original plain TeX definition of \newinsert.

```

247 \def\newinsert#1{\global\advance\insc@unt \m@ne
248 \ch@ck0\insc@unt\count
249 \ch@ck1\insc@unt\dimen
250 \ch@ck2\insc@unt\skip
251 \ch@ck4\insc@unt\box
252 \allocationnumber\insc@unt
253 \global\chardef#1\allocationnumber
254 \wlog{\string#1=\string\insert\the\allocationnumber}}
255 \else

```

The highest register allowed with \insert.

```

256 \ifx\directlua\@undefined
257 \chardef\@insert@top255
258 \else
259 \chardef\@insert@top\@alloc@top
260 \fi

```

If the classic registers are exhausted, take an insert from the free float list and use \extrafloats to add a new float to that list.

```

261 \def\newinsert#1{%
262 \@tempswafalse
263 \global\advance\insc@unt\m@ne
264 \ifnum\count10<\insc@unt
265 \ifnum\count11<\insc@unt
266 \ifnum\count12<\insc@unt
267 \ifnum\count14<\insc@unt
268 \@tempswatrue
269 \fi\fi\fi\fi
270 \if@tempswa
271 \allocationnumber\insc@unt
272 \else
273 \global\advance\insc@unt\@ne
274 \extrafloats\@ne
275 \@next\@currbox\@freelist
276 {\ifnum\@currbox<\@insert@top
277 \allocationnumber\@currbox
278 \else
279 \ch@ck0\m@ne\insert
280 \fi}%
281 {\ch@ck0\m@ne\insert}%
282 \fi

```

```

283 \global\chardef#1\allocationnumber
284 \wlog{\string#1=\string\insert\the\allocationnumber}%
285 }

286 \fi
287 </2ekernel | latexrelease>

288 <latexrelease>\EndIncludeInRelease
289 <latexrelease>\IncludeInRelease{0000/00/00}%
290 <latexrelease>{\newinsert}{Extended \newinsert}%
291 <latexrelease>\let\@insert@top\@undefined
292 <latexrelease>\def\newinsert#1{\global\advance\insc@unt \m@ne
293 <latexrelease> \ch@ck0\insc@unt\count
294 <latexrelease> \ch@ck1\insc@unt\dimen
295 <latexrelease> \ch@ck2\insc@unt\skip
296 <latexrelease> \ch@ck4\insc@unt\box
297 <latexrelease> \allocationnumber\insc@unt
298 <latexrelease> \global\chardef#1\allocationnumber
299 <latexrelease> \wlog{\string#1=\string\insert\the\allocationnumber}}
300 <latexrelease>\EndIncludeInRelease
301 <*2ekernel>

```

*(End definition for \newinsert.)*

**\ch@ck**

```

302 \gdef\ch@ck#1#2#3{%
303   \ifnum\count1#1<#2\else
304     \errmessage{No room for a new #3}%
305   \fi}

```

*(End definition for \ch@ck.)*

**\newhelp**

```

306 \def\newhelp#1#2{\newtoks#1#1\expandafter{\csname#2\endcsname}}

```

*(End definition for \newhelp.)*

**\@inputcheck** Allocate read stream for testing and output stream that is never open and thus writes to the terminal.

**\@unused**

```

307 \newread\@inputcheck
308 \newwrite\@unused

```

*(End definition for \@inputcheck and \@unused.)*

**\maxdimen** Here are some examples of allocation.

**\hideskip**

```

309 \newdimen\maxdimen \maxdimen=16383.99999pt % the largest legal <dimen>
310 \newskip\hideskip \hideskip=-1000pt plus 1fill % negative but can grow

```

*(End definition for \maxdimen and \hideskip.)*

**\p@**

**\z@**

**\z@skip**

**\voidb@x**

```

311 \newdimen\p@ \p@=1pt % this saves macro space and time
312 \newdimen\z@ \z@=0pt % can be used both for 0pt and 0
313 \newskip\z@skip \z@skip=0pt plus0pt minus0pt
314 \newbox\voidb@x % permanently void box register

```



(End definition for \p@ and others.)

Assign initial values to T<sub>E</sub>X's parameters

```
315 \message{parameters,}
```

All of T<sub>E</sub>X's numeric parameters are listed here, but the code is commented out if no special value needs to be set. INITEX makes all parameters zero except where noted. *Historical E<sub>T</sub><sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

```
316 \pretolerance=100
317 \tolerance=200 % INITEX sets this to 10000
318 \hbadness=1000
319 \vbadness=1000
320 \linepenalty=10
321 \hyphenpenalty=50
322 \exhyphenpenalty=50
323 \binoppenalty=700
324 \relpenalty=500
325 \clubpenalty=150
326 \widowpenalty=150
327 \displaywidowpenalty=50
328 \brokenpenalty=100
329 \predisplaypenalty=10000
    \postdisplaypenalty=0
    \interlinepenalty=0
    \floatingpenalty=0, set during \insert
    \outputpenalty=0, set before TeX enters \output
330 \doublehyphendemerits=10000
331 \finalhyphendemerits=5000
332 \adjdemerits=10000
333 % \looseness=0, cleared by TeX after each paragraph
334 % \pausing=0
335 % \holdinginserts=0
336 % \tracingonline=0
337 % \tracingmacros=0
338 % \tracingstats=0
339 % \tracingparagraphs=0
340 % \tracingpages=0
341 % \tracingoutput=0
```

In the past \LaTeX{} used the default value of \texttt{1} for \cs{tracinglostchars} because this was the best it could do. This way one would at least get a warning in the \texttt{.log} file. e-TeX{} improved on that and supported a value of \texttt{2} to show the warning on the terminal, so we could have changed the default when we made the e-TeX{} extensions required—however, we overlooked that opportunity.

In 2021 this parameter was improved on again and now also accepts the value \texttt{3}

(error on the terminal). This made us realize that we should change the default. Using \texttt{3} would really be the best, but for compatibility reasons we only use \texttt{2}.

\changes{v2.3g}{2021/07/16}{Use 2 as default value for \cs{tracinglostchars}}

```
342 \tracinglostchars=2
```

```

343 % \tracingcommands=0
344 % \tracingrestores=0

\begin{macro}{\tracingstacklevels}
  For Lua\TeX, the \cs{tracingstacklevels} functionality was
  implemented as a callback, so here we just define the count register
  to hold the value of the parameter.

345 </2ekernel>
346 <*2ekernel | latexrelease>
347 <latexrelease>\IncludeInRelease{2021/06/01}{\tracingstacklevels}%
348 <latexrelease>          {tracingstacklevels}%
349 \ifx\directlua\@undefined
350 % \tracingstacklevels=0 % added in 2021
351 \else
352   \newcount\tracingstacklevels
353   % Code for \tracingstacklevels defined in ltfinal.dtx
354 \fi
355 <latexrelease>\EndIncludeInRelease
356 <latexrelease>
357 <latexrelease>\IncludeInRelease{0000/00/00}{\tracingstacklevels}%
358 <latexrelease>          {tracingstacklevels}%
359 <latexrelease>\ifx\directlua\@undefined
360 <latexrelease>\else
361 <latexrelease> \let\tracingstacklevels\@undefined
362 <latexrelease>\fi
363 <latexrelease>\EndIncludeInRelease
364 </2ekernel | latexrelease>
365 <*2ekernel>

\end{macro}

\language=0

366 \uchyph=1

\lefthyphenmin=2 \righthyphenmin=3 set below
\globaldefs=0
\maxdeadcycles=25 % INITEX does this
\hangafter=1 % INITEX does this, also TeX after each paragraph
\fam=0
\mag=1000 % INITEX does this
\escapechar='\ % INITEX does this

367 \defaultthyphenchar='\-
368 \defaultskewchar=-1

\endlinechar='\^M % INITEX does this
\newlinechar=-1 \LaTeX\ sets this in ltdefs.dtx.

369 \delimiterfactor=901

```

```

\time=now % TeX does this at beginning of job
\day=now % TeX does this at beginning of job
\month=now % TeX does this at beginning of job
\year=now % TeX does this at beginning of job

```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

In L<sup>A</sup>T<sub>E</sub>X we don't want box information in the transcript unless we do a full tracing.

```

370 \showboxbreadth=-1
371 \showboxdepth=-1
372 \errorcontextlines=-1

373 \hfuzz=0.1pt
374 \vfuzz=0.1pt
375 \overfullrule=5pt
376 \maxdepth=4pt
377 \splitmaxdepth=\maxdimen
378 \boxmaxdepth=\maxdimen

```

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

\lineskiplimit=0pt, changed by \normalbaselines

```

379 \delimitershortfall=5pt
380 \nulldelimiterspace=1.2pt
381 \scriptspace=0.5pt

```

```

\mathsurround=0pt
\predisplaysize=0pt, set before TeX enters $$
\displaywidth=0pt, set before TeX enters $$
\displayindent=0pt, set before TeX enters $$

```

```

382 \parindent=20pt

```

```

\hangindent=0pt, zeroed by TeX after each paragraph
\hoffset=0pt
\voffset=0pt

```

```

\baselineskip=0pt, changed by \normalbaselines
\lineskip=0pt, changed by \normalbaselines

```

```

383 \parskip=0pt plus 1pt
384 \abovedisplayskip=12pt plus 3pt minus 9pt
385 \abovedisplayshortskip=0pt plus 3pt
386 \belowdisplayskip=12pt plus 3pt minus 9pt
387 \belowdisplayshortskip=7pt plus 3pt minus 4pt

```

```

\leftskip=0pt
\rightskip=0pt

```

```

388 \topskip=10pt
389 \splittopskip=10pt

```

```

\tabskip=0pt
\spaceskip=0pt
\xspaceskip=0pt

```

```

390 \parfillskip=0pt plus 1fil

```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

```
\normalbaselineskip We also define special registers that function like parameters:
\normallineskip 391 \newskip\normalbaselineskip \normalbaselineskip=12pt
\normallineskiplimit 392 \newskip\normallineskip \normallineskip=1pt
393 \newdimen\normallineskiplimit \normallineskiplimit=0pt

(End definition for \normalbaselineskip, \normallineskip, and \normallineskiplimit.)

\interfootlinepenalty
394 \newcount\interfootnotelinepenalty \interfootnotelinepenalty=100

(End definition for \interfootlinepenalty.)
Definitions for preloaded fonts

\magstephalf
\magstep 395 \def\magstephalf{1095 }
396 \def\magstep#1{\ifcase#1 \@m\or 1200\or 1440\or 1728\or
397 2074\or 2488\fi\relax}

(End definition for \magstephalf and \magstep.)
Macros for setting ordinary text

\frenchspacing
\nonfrenchspacing 398 \def\frenchspacing{\sfcode'\.\@m \sfcode'\?\@m \sfcode'\!\@m
399 \sfcode'\:\@m \sfcode'\;\@m \sfcode'\,\@m}
400 \def\nonfrenchspacing{\sfcode'\.3000\sfcode'\?3000\sfcode'\!3000%
401 \sfcode'\:2000\sfcode'\;1500\sfcode'\,1250 }

(End definition for \frenchspacing and \nonfrenchspacing.)

\normalbaselines
402 \def\normalbaselines{\lineskip\normallineskip
403 \baselineskip\normalbaselineskip \lineskiplimit\normallineskiplimit}

(End definition for \normalbaselines.)

\M Save a bit of space by using \let here.
\I 404 \def\^M{\ } % control <return> = control <space>
405 \let\^I\^M % same for <tab>

(End definition for \M and \I.)

\lq
\rq 406 \def\lq{' }
407 \def\rq{' }

(End definition for \lq and \rq.)

\lbrack
\rbrack 408 \def\lbrack{[ }
409 \def\rbrack{[ ]}

(End definition for \lbrack and \rbrack.)
```

`\aa` These are not from plain.tex but they are similar to other commands found here and  
`\AA` nowhere else, being alternate input forms for characters.

```

410 \def \aa {\r a}
411 \def \AA {\r A}

```

(End definition for `\aa` and `\AA`.)

`\endgraf`  
`\endline`

```

412 \let\endgraf=\par
413 \let\endline=\cr

```

(End definition for `\endgraf` and `\endline`. These functions are documented on page 298.)

`\space`

```

414 \def\space{ }

```

(End definition for `\space`.)

`\empty` This probably ought to go altogether, but let it to the L<sup>A</sup>T<sub>E</sub>X version to save space.

```

415 \let\empty\@empty

```

(End definition for `\empty`.)

`\null`

```

416 \def\null{\hbox{}}

```

(End definition for `\null`.)

`\bgroup`  
`\egroup`

```

417 \let\bgroup={
418 \let\egroup=}

```

(End definition for `\bgroup` and `\egroup`.)

`\obeylines` In `\obeylines`, we say `\let^M=\obeyedline` instead of `\def^M{\obeyedline}` since  
`\obeyspaces` this allows, for example, `\let\obeyedline=\cr \obeylines \halign{...`

This is essentially a plain T<sub>E</sub>X trick and in its original version where you had to use  
to use `\let\par=\cr` not really a safe idea in L<sup>A</sup>T<sub>E</sub>X. If anybody used this trick this now  
breaks (and one needs to use `\obeyedline` instead).

```

419 </2ekernel>
420 <*2ekernel | latexrelease>
421 <latexrelease>\IncludeInRelease{2022/06/01}{\obeylines}%
422 <latexrelease>    {Add a redirection to obeylines and obeyspaces}%

```

If the active `^M` escapes, e.g. into a `\write` (which is effectively in a different context)  
we don't want the definition from `\obeylines` but rather a simple `\par` (in fact even the  
primitive one, not the L<sup>A</sup>T<sub>E</sub>X version `\para_end`: which is only defined later.

```

423 \begingroup
424 \catcode'\^M=\active % these lines must end with %
425 \gdef\obeylines{\catcode'\^M\active%
426 \let^M\obeyedline%

```

The next line ending the definition is rather curious and it took me awhile to understand why rollback fails. The problem is the following: if `latexrelease` is used, then blocks of `\IncludeInRelease ... \EndIncludeInRelease` are bypassed at high speed by grabbing each as a delimited argument. However, in that case `^^M` is seen not as code but as line ending characters and in that mode `TEX` discards everything from that point onwards to the real end of the line so it works like a comment — pretty strange really (and I think due to the fact the the original pascal compiler could have some garbage showing up after the normal line ending character. Thus we really have to make sure that any closing braces is not one the same line as an `^^M`, because otherwise it would get dropped and we end with unbalanced braces and never see the `\EndIncludeInRelease` — weird. In other places it doesn't matter because we aren't using the incomplete result.

```

427 }%
428 \global\let^^M\par % this is in case ^^M appears in a \write
429 \endgroup

```

`\obeyedline` expands by default to `\par` with whatever definition `\par` has when it is executed. It can, however, be redefined (before calling `\obeylines!`) to achieve some special effects. If you want to alter its definition when already in the scope of `\obeylines`, it has no effect (because `\let` is used above). In that case simply make another call to `\obeylines` immediately. As you are in a restricted scope all that happens is that your redefinition is applied.

For the default definition we have to use `\def` not `\let` because the meaning of `\par` can change and we want to use the one that is current when `\obeylines` act.

There is a small subtlety here: in an `\edef` the active `^^M` stayed put (because it was equal to to the primitive `\par`), now `\obeyedline` expands and you get what it contains, i.e., in that case `\par`, into the `\edef` or `\mark` unless we use `\protected` on it.

```

430 \protected\gdef\obeyedline{\par}

```

The definition of `\obeyspaces` is changed in the same way and now executes `\obeyedspace` for each active space.

```

\obeyedspace 431 \global\let\obeyedspace\space

432 \begingroup
433 \catcode'\ =\active%
434 \gdef\obeyspaces{\catcode'\ \active\let =\obeyedspace}%

```

An active space elsewhere generates `\space` by default (for example in a `\write`).

```

435 \global\let =\space%
436 \endgroup

437 </2ekernel | latexrelease>
438 <latexrelease>\EndIncludeInRelease
439 <latexrelease>\IncludeInRelease{0000/00/00}{\obeylines}%
440 <latexrelease>    {Add a redirection to obeylines and obeyspaces}%
441 <latexrelease>

```

From 2019 onwards the commands are made robust (somewhat later in the kernel sources). So if we roll back they are robust, so when redefining them we have get rid of the robust payload first. Otherwise that is seen by the later rollback below, which then installs a fragile version of the new definition on top of the one we roll back to here, sigh. `\kernel@make@fragile` also changes its definition (later own) so this is done directly.

```

442 <latexrelease>\expandafter\let\csname obeylines \endcsname \@undefined

```

```

443 <latexrelease>\expandafter\let\csname obeyspace \endcsname\@undefined
444 <latexrelease>
445 <latexrelease>\begingroup
446 <latexrelease>\catcode'\^M=\active % these lines must end with %
447 <latexrelease> \gdef\obeylines{\catcode'\^M\active \let^M\par %

```

Closing brace on a separate line (see comment above).

```

448 <latexrelease> }%

```

Another pitfall: if we do a rollback `\par` is no longer the primitive, so the roll back definition needs `\let` to what is new the primitive.

```

449 <latexrelease> \global\let^M\RawParEnd % this is in case ^M appears in a \write
450 <latexrelease>\endgroup
451 <latexrelease>\def\obeyspaces{\catcode'\ \active}
452 <latexrelease>
453 <latexrelease>\let\obeyedline\@undefined
454 <latexrelease>\let\obeyedspace\@undefined
455 <latexrelease>\EndIncludeInRelease
456 <*2ekernel>

```

*(End definition for \obeylines and others.)*

`\loop` We use Kabelschacht's method of doing loops, see TUB 8#2 (1987). (unless that breaks something :-). It turned out to need an extra `\relax`: see pr/642 (`\loop` could do one iteration too much in certain cases).

```

457 \long\def \loop #1\repeat{%
458   \def\iterate{#1\relax % Extra \relax
459     \expandafter\iterate\fi
460   }%
461   \iterate
462   \let\iterate\relax
463 }

```

This setting of `\repeat` is needed to make `\loop...\if...\repeat` skippable within another `\if....`

```

464 \let\repeat=\fi

```

*(End definition for \loop, \iterate, and \repeat.)*

L<sup>A</sup>T<sub>E</sub>X defines `\smallskip`, etc. in `ltspace.dtx`.

```

\nointerlineskip
\offinterlineskip
465 \def\nointerlineskip{\prevdepth-\@m\p@}
466 \def\offinterlineskip{\baselineskip-\@m\p@
467   \lineskip\z@ \lineskiplimit\maxdimen}

```

*(End definition for \nointerlineskip and \offinterlineskip.)*

```

\vglue
\hglue
468 \def\vglue{\afterassignment\vgl\skip@=}
469 \def\vgl@{\par \dimen@\prevdepth \hrule \@height\z@
470   \nobreak\vskip\skip@ \prevdepth\dimen@}
471 \def\hglue{\afterassignment\hgl\skip@=}
472 \def\hgl@{\leavevmode \count@\spacefactor \vrule \@width\z@
473   \nobreak\hskip\skip@ \spacefactor\count@}

```

(End definition for `\vglue` and `\hglue`.)

L<sup>A</sup>T<sub>E</sub>X defines `~` in `ltdfns.dtx`.

`\slash` This generates a `/` acting a bit like `-` but still allows hyphenation in the word part preceding it (but not after).

```
474 \def\slash{/\penalty\exhyphenpenalty}
```

(End definition for `\slash`.)

`\break`

`\nobreak` 475 `\def\break{\penalty-\@M}`

`\allowbreak` 476 `\def\nobreak{\penalty \@M}`

```
477 \def\allowbreak{\penalty \z@}
```

(End definition for `\break`, `\nobreak`, and `\allowbreak`.)

`\filbreak`

`\goodbreak` 478 `\def\filbreak{\par\vfil\penalty-200\vfilneg}`

```
479 \def\goodbreak{\par\penalty-500 }
```

(End definition for `\filbreak` and `\goodbreak`.)

`\eject` Define `\eject` as in plain T<sub>E</sub>X but define `\supereject` only in the compatibility file.

```
480 \def\eject{\par\break}
```

(End definition for `\eject`.)

`\removelastskip`

```
481 \def\removelastskip{\ifdim\lastskip=\z@\else\vskip-\lastskip\fi}
```

(End definition for `\removelastskip`.)

`\smallbreak`

`\medbreak` 482 `\def\smallbreak{\par\ifdim\lastskip<\smallskipamount`

`\bigbreak` 483 `\removelastskip\penalty-50\smallskip\fi}`

```
484 \def\medbreak{\par\ifdim\lastskip<\medskipamount
```

```
485 \removelastskip\penalty-100\medskip\fi}
```

```
486 \def\bigbreak{\par\ifdim\lastskip<\bigskipamount
```

```
487 \removelastskip\penalty-200\bigskip\fi}
```

(End definition for `\smallbreak`, `\medbreak`, and `\bigbreak`.)

`\m@th`

```
488 \def\m@th{\mathsurround\z@}
```

(End definition for `\m@th`.)

`\underbar` Due to L<sup>A</sup>T<sub>E</sub>X's redefinition of `\underline` plain T<sub>E</sub>X's `\underbar` can be done in a simpler fashion (but do we need it at all?).

```
489 \def\underbar#1{\underline{\sbox\tw@{#1}\dp\tw@\z@\box\tw@}}
```

(End definition for `\underbar`.)

`\strutbox` L<sup>A</sup>T<sub>E</sub>X sets `\strutbox` in `\set@fontsize`.

`\strut` 490 `\newbox\strutbox`

```
491 \def\strut{\relax\ifmmode\copy\strutbox\else\unhcopy\strutbox\fi}
```



(End definition for `\strutbox` and `\strut`.)

`\hidewidth` For alignment entries that can stick out.

```
492 \def\hidewidth{\hskip\hideskip}
```

(End definition for `\hidewidth`.)

`\narrower`

```
493 \def\narrower{%
494   \advance\leftskip\parindent
495   \advance\rightskip\parindent}
```

(End definition for `\narrower`.)

L<sup>A</sup>T<sub>E</sub>X defines `\ae` and similar commands elsewhere.

```
496 \chardef\%='\'%
497 \chardef\&='\'&
498 \chardef\#='\'#
```

Most text commands are actually encoding specific and therefore defined later, so commented out or removed from this file.

`\leavevmode` begins a paragraph, if necessary

```
499 \def\leavevmode{\unhbox\voidb@x}
```

(End definition for `\leavevmode`.)

`\mathhexbox`

```
500 \def\mathhexbox#1#2#3{\mbox{$\m@th \mathchar"#1#2#3$}}
```

(End definition for `\mathhexbox`.)

`\ialign`

```
501 \def\ialign{\everycr{}\tabskip\z@skip\halign} % initialized \halign
```

(End definition for `\ialign`.)

`\oalign`

```
\o@lign 502 \def\oalign#1{\leavevmode\topof\baselineskip\z@skip \lineskip.25ex%
\oalign 503   \ialign{##\crrc#1\crrc}}
504 \def\o@lign{\lineskiplimit\z@ \oalign}
505 \def\oalign{\lineskiplimit-\maxdimen \oalign}
```

(End definition for `\oalign`, `\o@lign`, and `\oalign`.)

`\sh@ft` The definition of this macro in `plain.tex` was improved in about 1997; but as a result its usage was changed and its new definition is not appropriate for L<sup>A</sup>T<sub>E</sub>X.

Since the version given here has been in use by L<sup>A</sup>T<sub>E</sub>X for many years it does not seem prudent to remove it now. As far as we can tell it has only been used to define `\b` and `\d` but this cannot be certain.

```
506 \def\sh@ft#1{\dimen@.00#1ex\multiply\dimen@\fontdimen1\font
507   \kern-.0156\dimen@} % compensate for slant in lowered accents
```

(End definition for `\sh@ft`.)

`\ltx@sh@ft` This is the L<sup>A</sup>T<sub>E</sub>X version of the second incarnation of the plain macro `\sh@ft`, which takes a dimension as its argument. It shifts a pseudo-accent horizontally by an amount proportional to the product of its argument and the slant-per-point (`fontdimen 1`).

```

508 \def\ltx@sh@ft #1{%
509   \dimen@ #1%
510   \kern \strip@pt
511     \fontdimen1\font \dimen@
512   } % kern by #1 times the current slant

```

*(End definition for \ltx@sh@ft.)*

L<sup>A</sup>T<sub>E</sub>X change: the text commands such as `\d`, `\b`, `\c`, `\copyright`, `\TeX` are now defined elsewhere.

L<sup>A</sup>T<sub>E</sub>X change: Make `\t` work in a moving argument. Now defined elsewhere.

`\hrulefill` L<sup>A</sup>T<sub>E</sub>X change: `\kern\z@` added to end of `\hrulefill` and `\dotfill` to make them work in ‘tabular’ and ‘array’ environments. (Change made 24 July 1987). L<sup>A</sup>T<sub>E</sub>X change: `\leavevmode` added at beginning of `\dotfill` and `\hrulefill` so that they work as expected in vertical mode.

```

513 \def\hrulefill{\leavevmode\leaders\hrule\hfill\kern\z@}

```

The box in `\dotfill` originally contained (in `plain.tex`):

```
\mkern 1.5mu .\mkern 1.5mu;
```

the width of .44em differs from this by .04pt which is probably an acceptable difference within leaders.

```

514 \def\dotfill{%
515   \leavevmode
516   \cleaders \hb@xt@ .44em{\hss.\hss}\hfill
517   \kern\z@}

```

*(End definition for \hrulefill and \dotfill.)*

INITEX sets `\sfcode x=1000` for all `x`, except that `\sfcode X=999` for uppercase letters. The following changes are needed:

```

518 \sfcode'\)=0 \sfcode\'=0 \sfcode'\]=0

```

The `\nonfrenchspacing` macro will make further changes to `\sfcode` values.

Definitions related to output

`\magnification` doesn’t work in L<sup>A</sup>T<sub>E</sub>X.

```

def\magnification{\afterassignment\m@g\count@}
def\m@g{\mag\count@
  \hsize6.5truein\vsiz8.9truein\dimen\footins8truein}

```

`\showoverfull` The following commands are used in debugging:

```

519 \def\showoverfull{\tracingonline\@ne}

```

*(End definition for \showoverfull.)*

`\showoutput`  
`\loggingoutput`

```

520 \gdef\loggingoutput{\tracingoutput\@ne
521   \showboxbreadth\maxdimen\showboxdepth\maxdimen\errorstopmode}
522 \gdef\showoutput{\loggingoutput\showoverfull}
523 </2ekernel>

```

*(End definition for \showoutput and \loggingoutput.)*

```

\tracingall
\loggingall
524 <latexrelease>\IncludeInRelease{2021/06/01}{\loggingall}
525 <latexrelease>          {\tracingstacklevels and \tracinglostchars=3}%
526 <*2ekernel | latexrelease>
527 \edef\loggingall{%
528   \tracingstats\tw@
529   \tracingpages\@ne
530   \tracinglostchars\thr@@
531   \tracingparagraphs\@ne
532   \tracinggroups\@ne
533   \tracingifs\@ne
534   \tracingscantokens\@ne
535   \tracingnesting\@ne
536   \errorcontextlines\maxdimen
537   \ifdefined\tracingstacklevels \tracingstacklevels\maxdimen \fi
538   \noexpand \loggingoutput
539   \tracingmacros\tw@
540   \tracingcommands\thr@@
541   \tracingrestores\@ne
542   \tracingassigns\@ne
543 }%
544 \def\tracingall{\showoverfull\loggingall}
545 </2ekernel | latexrelease>
546 <latexrelease>\EndIncludeInRelease
547 <latexrelease>
548 <latexrelease>\IncludeInRelease{2015/01/01}{\loggingall}{etex tracing}%
549 <latexrelease>\ifx\tracingscantokens\@undefined
550 <latexrelease>\gdef\loggingall{%
551 <latexrelease> \tracingstats\tw@
552 <latexrelease> \tracingpages\@ne
553 <latexrelease> \tracinglostchars\@ne
554 <latexrelease> \tracingparagraphs\@ne
555 <latexrelease> \errorcontextlines\maxdimen
556 <latexrelease> \loggingoutput
557 <latexrelease> \tracingmacros\tw@
558 <latexrelease> \tracingcommands\tw@
559 <latexrelease> \tracingrestores\@ne
560 <latexrelease> }%
561 <latexrelease>\else
562 <latexrelease>\gdef\loggingall{%
563 <latexrelease> \tracingstats\tw@
564 <latexrelease> \tracingpages\@ne
565 <latexrelease> \tracinglostchars\tw@
566 <latexrelease> \tracingparagraphs\@ne
567 <latexrelease> \tracinggroups\@ne
568 <latexrelease> \tracingifs\@ne
569 <latexrelease> \tracingscantokens\@ne
570 <latexrelease> \tracingnesting\@ne
571 <latexrelease> \errorcontextlines\maxdimen
572 <latexrelease> \loggingoutput
573 <latexrelease> \tracingmacros\tw@
574 <latexrelease> \tracingcommands\thr@@
575 <latexrelease> \tracingrestores\@ne
576 <latexrelease> \tracingassigns\@ne

```

```

577 <latexrelease>}%
578 <latexrelease>\fi
579 <latexrelease>\gdef\tracingall{\showoverfull\loggingall}
580 <latexrelease>\EndIncludeInRelease
581 <latexrelease>
582 <latexrelease>\IncludeInRelease{0000/00/00}{\loggingall}{etex tracing}%
583 <latexrelease>\gdef\loggingall{\tracingcommands\tw@\tracingstats\tw@
584 <latexrelease> \tracingpages\@ne\tracinglostchars\@ne
585 <latexrelease> \tracingmacros\tw@\tracingparagraphs\@ne\tracingrestores\@ne
586 <latexrelease> \errorcontextlines\maxdimen\loggingoutput}
587 <latexrelease> \gdef\tracingall{\loggingall\showoverfull}
588 <latexrelease>\EndIncludeInRelease

```

(End definition for \tracingall and \loggingall.)

\tracingnone

```

589 <latexrelease>\IncludeInRelease{2015/01/01}{\tracingnone}%
590 <latexrelease> \turn off etex tracing}%
591 <*2kernel | latexrelease>
592 \edef\tracingnone{%
593 \tracingassigns\z@
594 \tracingrestores\z@
595 \tracingonline\z@
596 \tracingcommands\z@
597 \showboxdepth\m@ne
598 \showboxbreadth\m@ne
599 \tracingoutput\z@
600 \errorcontextlines\m@ne
601 \ifdefined\tracingstacklevels \tracingstacklevels\z@ \fi
602 \tracingnesting\z@
603 \tracingscantokens\z@
604 \tracingifs\z@
605 \tracinggroups\z@
606 \tracingparagraphs\z@
607 \tracingmacros\z@
608 \tracinglostchars\@ne
609 \tracingpages\z@
610 \tracingstats\z@
611 }%
612 </2kernel | latexrelease>
613 <latexrelease>\EndIncludeInRelease
614 <latexrelease>
615 <latexrelease>\IncludeInRelease{2015/01/01}{\tracingnone}%
616 <latexrelease> \turn off etex tracing}%
617 <latexrelease>\ifx\tracingscantokens\@undefined
618 <latexrelease>\def\tracingnone{%
619 <latexrelease> \tracingonline\z@
620 <latexrelease> \tracingcommands\z@
621 <latexrelease> \showboxdepth\m@ne
622 <latexrelease> \showboxbreadth\m@ne
623 <latexrelease> \tracingoutput\z@
624 <latexrelease> \errorcontextlines\m@ne
625 <latexrelease> \tracingrestores\z@
626 <latexrelease> \tracingparagraphs\z@

```

```

627 <latexrelease> \tracingmacros\z@
628 <latexrelease> \tracinglostchars\@ne
629 <latexrelease> \tracingpages\z@
630 <latexrelease> \tracingstats\z@
631 <latexrelease>}%
632 <latexrelease>\else
633 <latexrelease>\def\tracingnone{%
634 <latexrelease> \tracingassigns\z@
635 <latexrelease> \tracingrestores\z@
636 <latexrelease> \tracingonline\z@
637 <latexrelease> \tracingcommands\z@
638 <latexrelease> \showboxdepth\m@ne
639 <latexrelease> \showboxbreadth\m@ne
640 <latexrelease> \tracingoutput\z@
641 <latexrelease> \errorcontextlines\m@ne
642 <latexrelease> \tracingnesting\z@
643 <latexrelease> \tracingscantokens\z@
644 <latexrelease> \tracingifs\z@
645 <latexrelease> \tracinggroups\z@
646 <latexrelease> \tracingparagraphs\z@
647 <latexrelease> \tracingmacros\z@
648 <latexrelease> \tracinglostchars\@ne
649 <latexrelease> \tracingpages\z@
650 <latexrelease> \tracingstats\z@
651 <latexrelease>}%
652 <latexrelease>\fi
653 <latexrelease>\EndIncludeInRelease
654 <latexrelease>
655 <latexrelease>\IncludeInRelease{0000/00/00}{\tracingnone}%
656 <latexrelease> {turn off etex tracing}%
657 <latexrelease>\let\tracingnone\@undefined
658 <latexrelease>\EndIncludeInRelease

```

(End definition for \tracingnone.)

\hideoutput

```

659 <*2ekernel | latexrelease>
660 <latexrelease>\IncludeInRelease{2015/01/01}{\hideoutput}%
661 <latexrelease> {hide output from tracing}%
662 \def\hideoutput{%
663 \tracingoutput\z@
664 \showboxbreadth\m@ne
665 \showboxdepth\m@ne
666 \tracingonline\m@ne
667 }%
668 <latexrelease>\EndIncludeInRelease
669 <latexrelease>
670 <latexrelease>\IncludeInRelease{0000/00/00}{\hideoutput}%
671 <latexrelease> {hide output from tracing}%
672 <latexrelease>\let\hideoutput\@undefined
673 <latexrelease>\EndIncludeInRelease
674 </2ekernel | latexrelease>

```

(End definition for \hideoutput.)

L<sup>A</sup>T<sub>E</sub>X change: \showhyphens Defined later.

Punctuation affects the spacing.

```
675 <*2ekernel>  
676 \nonfrenchspacing  
677 </2ekernel>
```

## File c

# ltvers.dtx

## 1 Version Identification

First we identify the date and version number of this release of L<sup>A</sup>T<sub>E</sub>X, and set `\everyjob` so that it is printed at the start of every L<sup>A</sup>T<sub>E</sub>X run.

`\fmtname` A `\patch@level` of 0 or higher denotes an official public release. A negative value indicates a candidate release that is not distributed.

`\fmtversion`

`\latexreleaseversion` If we put code updates into the kernel that are supposed to go into the next release we set the `\patch@level` to -1 and the `\fmtversion` / `\latexreleaseversion` to the dated of the next release (guessed, the real value is not so important and will get corrected when we make the release official).

`\patch@level`

If the `\patch@level` is already at -1 we do nothing here and use the `\fmtversion` date for any new `\IncludeInRelease` line when we add further code.

Finally, if we do make a public release we either just set the `\patch@level` to zero (if our initial guess was good) or we also change the date and then have to additionally change to that date on all the `\IncludeInRelease` statements that used the “guessed” date.

```
1 <*2ekernel>
2 \def\fmtname{LaTeX2e}
3 \edef\fmtversion
4 </2ekernel>
5 <latexrelease>\edef\latexreleaseversion
6 <*2ekernel | latexrelease>
7 {2022-06-01}
8 </2ekernel | latexrelease>
9 <*2ekernel>
10 \def\patch@level{3}
```

For more fine grain control there is the possibility to name the current development branch. This is only used when the `\patch@level` is negative (i.e., a pre-release format) and is intended to help us internally when we locally install a format out of some development branch.

```
\development@branch@name 11 \edef\development@branch@name{}
```

*(End definition for `\fmtname` and others.)*

Check that the format being made is not too old. The error message complains about ‘more than 5 years’ but in fact the error is not triggered until 65 months.

This code is currently not activated as we don’t know if we already got to the last official 2e version (due to staff shortage or due to a successor (think positive:-)).

```
12 \iffalse
13 \def\reserved@a#1/#2/#3\@nil{%
14   \count@ \year
15   \advance\count@-#1\relax
16   \multiply\count@ by 12\relax
17   \advance\count@\month
18   \advance\count@-#2\relax}
19 \expandafter\reserved@a\fmtversion\@nil
```

\count@ is now the age of this file in months. Take a generous definition of ‘year’ so this message is not generated too often.

```

\IncludeInRelease
\EndIncludeInRelease
\@IncludeInRelease
\@IncludeInRelease
@gobble@IncludeInRelease
@check@IncludeInRelease

```



```

69 <*2ekernel | latexrelease>
70 <latexrelease>\newif\if@includeinrelease
71 <latexrelease>\@includeinreleasefalse
72 \def\IncludeInRelease#1{%
73   \if@includeinrelease
74     \PackageError{latexrelease}{mis-matched IncludeInRelease}%
75       {There is an \string\EndIncludeRelease\space missing}%
76   \@includeinreleasefalse
77   \fi
78   \ifnum0%
79     \ifx\new@moduledate\@empty\else 1\fi
80     \ifnum \expandafter\@parse@version#1//00\@nil=0 1\fi
81     =11
82     \expandafter\@firstoftwo
83   \else
84     \expandafter\@secondoftwo
85   \fi
86   {\finish@module@release{#1}}%
87   {\kernel@ifnextchar[%
88     {\@IncludeInRelease{#1}}
89     {\@IncludeInRelease{#1}[#1]}}}%
90 \def\finish@module@release#1#2#3{%
91   \toks@{[#1] #3}%
92   \begingroup
93     \edef\x{\detokenize\expandafter{\new@modulename}}%
94     \edef\y{\detokenize{#2}}%
95   \expandafter\endgroup
96   \ifx\x\y \else
97     \@latex@error{\noexpand\IncludeInRelease dated #1 in a module is not
98       allowed.\MessageBreak Use a date at least equal to \new@moduledate
99       \space for complete rollback}\@ehd
100   \fi
101   \ifnum\expandafter\@parse@version\new@moduledate//00\@nil
102     >\expandafter\@parse@version\fmtversion//00\@nil
103     \GenericInfo{ }\{Applying: \the\toks@}%
104   \else
105     \GenericInfo{ }\{Skipping: \the\toks@}%
106     \expandafter\gobble@finish@module@release
107   \fi}
108 \long\def\gobble@finish@module@release#1\EndModuleRelease{%
109   \EndModuleRelease}

```

If a specific date has not been specified in latexrelease use ‘#1’.

```

110 \def\@IncludeInRelease#1[#2]{\@IncludeInRelease{#2}}
111 \def\@IncludeInRelease#1#2#3{%
112   \toks@{[#1] #3}%
113   \expandafter\ifx\csname\string#2+\@currname+IIR\endcsname\relax

```

If we roll back and the first patch already match then applying that is actually reapplying what is already in the format, i.e., it is useless and possibly allocating new registers. However, it makes the logic simpler so this is the way it is for now. In theory we could always jump over the first patch because that is only really needed for rolling forward. So maybe one day ...

```

114 \ifnum\expandafter\@parse@version#1//00\@nil
115 >\expandafter\@parse@version\fmtversion//00\@nil
116 \GenericInfo{}\{Skipping: \the\toks@}%
117 \expandafter\expandafter\expandafter\@gobble@IncludeInRelease
118 \else
119 \GenericInfo{}\{Applying: \the\toks@}%
120 \@includeinreleasetrue
121 \expandafter\let\csname\string#2+\@currname+IIR\endcsname\@empty
122 \fi
123 \else
124 \GenericInfo{}\{Already applied: \the\toks@}%
125 \expandafter\@gobble@IncludeInRelease
126 \fi
127 }
128 \def\EndIncludeInRelease{%
129 \if@includeinrelease
130 \@includeinreleasefalse
131 \else
132 \PackageError{latexrelease}{mis-matched EndIncludeInRelease}{}%
133 \fi
134 \if@skipping@module
135 \expandafter\new@module@skip
136 \fi}
137 \long\def\@gobble@IncludeInRelease#1\EndIncludeInRelease{%
138 \@includeinreleasefalse
139 \@check@IncludeInRelease#1\IncludeInRelease\@check@IncludeInRelease
140 \end@check@IncludeInRelease}
141 \long\def\@check@IncludeInRelease#1\IncludeInRelease
142 #2#3\@end@check@IncludeInRelease{%
143 \ifx\@check@IncludeInRelease#2\else
144 \PackageError{latexrelease}{skipped IncludeInRelease for tag \string#2}{}%
145 \fi
146 \if@skipping@module
147 \expandafter\new@module@skip
148 \fi}

```

(End definition for `\IncludeInRelease` and others.)

## 1.1 Declaring an all-new module

`\if@skipping@module` When we have a whole new module, we can't roll back to a date where such module exists, otherwise hundreds of "command already defined" errors will pop up. But we can't skip it altogether either, because the module might have changes we still want applied, so a more detailed cherry-picking of code chunks have to be done.

```

\NewModuleRelease
\EndModuleRelease
\new@module@skip
\new@modulename
\new@moduledate
149 \let\if@skipping@module\iffalse
150 \def\@skipping@moduletrue{\let\if@skipping@module\iftrue}
151 \def\@skipping@modulefalse{\let\if@skipping@module\iffalse}
152 \let\new@modulename\@empty
153 \let\new@moduledate\@empty
154 \def\NewModuleRelease#1#2#3{%
155 \ifx\new@modulename\@empty \else
156 \latex@error{Nested \noexpand\NewModuleRelease forbidden.}\@ehd \fi

```

```

157 \edef\new@moduledate{#1}%
158 \edef\new@modulename{#2}%
159 \GenericInfo{}{BEGIN module: \new@modulename\space (\new@moduledate)}%
160 \GenericInfo{}{ \@spaces\@spaces\@spaces\space#3\@gobble}%
161 \ifnum\sourceLaTeXdate<%
162     \expandafter\@parse@version\new@moduledate//00\@nil\relax
163     \ifnum\expandafter\@parse@version\fmtversion//00\@nil<%
164         \expandafter\@parse@version\new@moduledate//00\@nil\relax
165         \GenericInfo{}{Skipping module \new@modulename}%
166         \expandafter\expandafter
167         \expandafter\gobble@finish@module@release
168     \else
169         \GenericInfo{}{Applying module \new@modulename}
170         \@skipping@modulefalse
171     \fi
172 \else
173     \GenericInfo{}{Skipping module \new@modulename}
174     \@skipping@moduletrue
175     \expandafter\new@module@skip
176 \fi}
177 \long\def\new@module@skip#1\IncludeInRelease{%
178 \long\def\reserved@a##1\EndModuleRelease{}%
179 \if\relax\detokenize\expandafter{\reserved@a#1{}}\EndModuleRelease\relax
180 \else
181     \@latex@error{Missing mandatory \string\IncludeInRelease{0000/00/00}}\@ehc
182     \expandafter\@secondoftwo
183 \fi
184 \@gobble
185     {\@expandtwoargs\IncludeInRelease
186         {0000/00/00}{\new@modulename}%
187         {ERROR! Emergency recovery}%
188         #1}%
189 \IncludeInRelease}
190 \def\EndModuleRelease{%
191 \ifx\new@modulename\@empty
192     \@latex@error{Extra \string\EndModuleRelease.}\@eha
193 \else
194     \GenericInfo{}{END module: \new@modulename\space (\new@moduledate)}%
195     \let\new@modulename\@empty
196     \let\new@moduledate\@empty
197     \@skipping@modulefalse
198 \fi}

(End definition for \if@skipping@module and others.)
199 </2ekernel | latexrelease>

```

# File d

## lualatex.dtx

### 1 Overview

LuaTeX adds a number of engine-specific functions to TeX. Several of these require set up that is best done in the kernel or need related support functions. This file provides *basic* support for LuaTeX at the L<sup>A</sup>T<sub>Ε</sub>X 2<sub>ε</sub> kernel level plus as a loadable file which can be used with plain TeX and L<sup>A</sup>T<sub>Ε</sub>X.

This file contains code for both TeX (to be stored as part of the format) and Lua (to be loaded at the start of each job). In the Lua code, the kernel uses the namespace `luatexbase`.

The following `\count` registers are used here for register allocation:

```
\e@alloc@attribute@count Attributes (default 258)
\e@alloc@ccodetable@count Category code tables (default 259)
\e@alloc@luafunction@count Lua functions (default 260)
  \e@alloc@whatsit@count User whatsits (default 261)
  \e@alloc@bytecode@count Lua bytecodes (default 262)
  \e@alloc@luachunk@count Lua chunks (default 263)
```

(`\count 256` is used for `\newmarks` allocation and `\count 257` is used for `\newXeTeXintercharclass` with XeTeX, with code defined in `ltxfinal.dtx`). With any L<sup>A</sup>T<sub>Ε</sub>X 2<sub>ε</sub> kernel from 2015 onward these registers are part of the block in the extended area reserved by the kernel (prior to 2015 the L<sup>A</sup>T<sub>Ε</sub>X 2<sub>ε</sub> kernel did not provide any functionality for the extended allocation area).

### 2 Core TeX functionality

The commands defined here are defined for possible inclusion in a future L<sup>A</sup>T<sub>Ε</sub>X format, however also extracted to the file `lualatex.tex` which may be used with older L<sup>A</sup>T<sub>Ε</sub>X formats, and with plain TeX.

```
\newattribute \newattribute{<attribute>}
  Defines a named \attribute, indexed from 1 (i.e. \attribute0 is never defined). Attributes initially have the marker value -7FFFFFFF ('unset') set by the engine.
\newcatcodetable \newcatcodetable{<catcodetable>}
  Defines a named \catcodetable, indexed from 1 (\catcodetable0 is never assigned). A new catcode table will be populated with exactly those values assigned by IniTeX (as described in the LuaTeX manual).
\newluafunction \newluafunction{<function>}
  Defines a named \luafunction, indexed from 1. (Lua indexes tables from 1 so \luafunction0 is not available).
\newluacmd \newluacmd{<function>}
  Like \newluafunction, but defines the command using \luadef instead of just assigning an integer.
```

<code>\newprotectedluacmd</code>	<code>\newluadef{⟨function⟩}</code>	Like <code>\newluacmd</code> , but the defined command is not expandable.
<code>\newwhatsit</code>	<code>\newwhatsit{⟨whatsit⟩}</code>	Defines a custom <code>\whatsit</code> , indexed from 1.
<code>\newluabytecode</code>	<code>\newluabytecode{⟨bytecode⟩}</code>	Allocates a number for Lua bytecode register, indexed from 1.
<code>\newluachunkname</code>	<code>\newluachunkname{⟨chunkname⟩}</code>	Allocates a number for Lua chunk register, indexed from 1. Also enters the name of the register (without backslash) into the <code>lua.name</code> table to be used in stack traces.
<code>\catcodetable@initex</code>	Predefined category code tables with the obvious assignments. Note that the <code>latex</code> and	
<code>\catcodetable@string</code>	<code>atletter</code> tables set the full Unicode range to the codes predefined by the kernel.	
<code>\catcodetable@latex</code>	<code>\setattribute{⟨attribute⟩}{⟨value⟩}</code>	
<code>\catcodetable@atletter</code>	<code>\unsetattribute{⟨attribute⟩}</code>	
<code>\setattribute</code>	Set and unset attributes in a manner analogous to <code>\setlength</code> . Note that attributes	
<code>\unsetattribute</code>	take a marker value when unset so this operation is distinct from setting the value to zero.	

### 3 Plain T<sub>E</sub>X interface

The `luatex` interface may be used with plain T<sub>E</sub>X using `\input{luatex}`. This inputs `luatex.tex` which inputs `etex.src` (or `etex.sty` if used with L<sup>A</sup>T<sub>E</sub>X) if it is not already input, and then defines some internal commands to allow the `luatex` interface to be defined.

The `luatexbase` package interface may also be used in plain T<sub>E</sub>X, as before, by inputting the package `\input luatexbase.sty`. The new version of `luatexbase` is based on this `luatex` code but implements a compatibility layer providing the interface of the original package.

## 4 Lua functionality

### 4.1 Allocators in Lua

<code>new_attribute</code>	<code>luatexbase.new_attribute(⟨attribute⟩)</code>	Returns an allocation number for the <code>⟨attribute⟩</code> , indexed from 1. The attribute will be initialised with the marker value <code>-"7FFFFFFF</code> ('unset'). The attribute allocation sequence is shared with the T <sub>E</sub> X code but this function does <i>not</i> define a token using <code>\attributedef</code> . The attribute name is recorded in the <code>attributes</code> table. A metatable is provided so that the table syntax can be used consistently for attributes declared in T <sub>E</sub> X or Lua.
<code>new_whatsit</code>	<code>luatexbase.new_whatsit(⟨whatsit⟩)</code>	Returns an allocation number for the custom <code>⟨whatsit⟩</code> , indexed from 1.
<code>new_bytecode</code>	<code>luatexbase.new_bytecode(⟨bytecode⟩)</code>	Returns an allocation number for a bytecode register, indexed from 1. The optional <code>⟨name⟩</code> argument is just used for logging.
<code>new_chunkname</code>	<code>luatexbase.new_chunkname(⟨chunkname⟩)</code>	Returns an allocation number for a Lua chunk name for use with <code>\directlua</code> and <code>\l<sub>u</sub>atexlua</code> , indexed from 1. The number is returned and also <code>⟨name⟩</code> argument is added to the <code>lua.name</code> array at that index.
<code>new_luafunction</code>	<code>luatexbase.new_luafunction(⟨functionname⟩)</code>	

Returns an allocation number for a lua function for use with `\luafunction`, `\lateluafunction`, and `\luadef`, indexed from 1. The optional  $\langle functionname \rangle$  argument is just used for logging.

These functions all require access to a named T<sub>E</sub>X count register to manage their allocations. The standard names are those defined above for access from T<sub>E</sub>X, e.g. `\e@alloc@attribute@count`, but these can be adjusted by defining the variable  $\langle type \rangle\_count\_name$  before loading `ltluatex.lua`, for example

```
local attribute_count_name = "attributetracker"
require("ltluatex")
```

would use a T<sub>E</sub>X `\count` (`\countdef`'d token) called `attributetracker` in place of `\e@alloc@attribute@count`.

## 4.2 Lua access to T<sub>E</sub>X register numbers

`registernumber` `luatexbase.registernumber( $\langle name \rangle$ )`

Sometimes (notably in the case of Lua attributes) it is necessary to access a register *by number* that has been allocated by T<sub>E</sub>X. This package provides a function to look up the relevant number using LuaT<sub>E</sub>X's internal tables. After for example `\newattribute\myattrib, \myattrib` would be defined by (say) `\myattrib=\attribute15`. `luatexbase.registernumber("myattrib")` would then return the register number, 15 in this case. If the string passed as argument does not correspond to a token defined by `\attributedef`, `\countdef` or similar commands, the Lua value `false` is returned.

As an example, consider the input:

```
\newcommand\test[1]{%
\typeout{#1: \expandafter\meaning\csname#1\endcsname^^J
\space\space\space\space
\directlua{tex.write(luatexbase.registernumber("#1") or "bad input")}%
}}

\test{undefinedrubbish}

\test{space}

\test{hbox}

\test{@MM}

\test{@tempdima}
\test{@tempdimb}

\test{strutbox}

\test{sixt@@n}

\attributedef\myattr=12
\myattr=200
\test{myattr}
```

If the demonstration code is processed with Lua $\text{\LaTeX}$  then the following would be produced in the log and terminal output.

```
undefinedrubbish: \relax
    bad input
space: macro:->
    bad input
hbox: \hbox
    bad input
@MM: \mathchar"4E20
    20000
@tempdima: \dimen14
    14
@tempdimb: \dimen15
    15
strutbox: \char"B
    11
sist@n: \char"10
    16
myattr: \attribute12
    12
```

Notice how undefined commands, or commands unrelated to registers do not produce an error, just return **false** and so print **bad input** here. Note also that commands defined by `\newbox` work and return the number of the box register even though the actual command holding this number is a `\chardef` defined token (there is no `\boxdef`).

### 4.3 Module utilities

`provides_module` `luatexbase.provides_module(<info>)`

This function is used by modules to identify themselves; the **info** should be a table containing information about the module. The required field **name** must contain the name of the module. It is recommended to provide a field **date** in the usual  $\text{\LaTeX}$  format `yyyy/mm/dd`. Optional fields **version** (a string) and **description** may be used if present. This information will be recorded in the log. Other fields are ignored.

`module_info` `luatexbase.module_info(<module>, <text>)`

`module_warning` `luatexbase.module_warning(<module>, <text>)`

`module_error` `luatexbase.module_error(<module>, <text>)`

These functions are similar to  $\text{\LaTeX}$ 's `\PackageError`, `\PackageWarning` and `\PackageInfo` in the way they format the output. No automatic line breaking is done, you may still use `\n` as usual for that, and the name of the package will be prepended to each output line.

Note that `luatexbase.module_error` raises an actual Lua error with `error()`, which currently means a call stack will be dumped. While this may not look pretty, at least it provides useful information for tracking the error down.

### 4.4 Callback management

`add_to_callback` `luatexbase.add_to_callback(<callback>, <function>, <description>)` Registers the *<function>* into the *<callback>* with a textual *<description>* of the function. Functions are inserted into the callback in the order loaded.

`remove_from_callback` `luatexbase.remove_from_callback(<callback>, <description>)` Removes the callback

function with  $\langle description \rangle$  from the  $\langle callback \rangle$ . The removed function and its description are returned as the results of this function.

<code>in_callback</code>	<code>luatexbase.in_callback(<math>\langle callback \rangle</math>, <math>\langle description \rangle</math>)</code> Checks if the $\langle description \rangle$ matches one of the functions added to the list for the $\langle callback \rangle$ , returning a boolean value.
<code>disable_callback</code>	<code>luatexbase.disable_callback(<math>\langle callback \rangle</math>)</code> Sets the $\langle callback \rangle$ to <code>false</code> as described in the LuaTeX manual for the underlying <code>callback.register</code> built-in. Callbacks will only be set to <code>false</code> (and thus be skipped entirely) if there are no functions registered using the callback.
<code>callback_descriptions</code>	A list of the descriptions of functions registered to the specified callback is returned. <code>{}</code> is returned if there are no functions registered.
<code>create_callback</code>	<code>luatexbase.create_callback(<math>\langle name \rangle</math>, <code>metatype</code>, <math>\langle default \rangle</math>)</code> Defines a user defined callback. The last argument is a default function or <code>false</code> .
<code>call_callback</code>	<code>luatexbase.call_callback(<math>\langle name \rangle</math>, ...)</code> Calls a user defined callback with the supplied arguments.

## 5 Implementation

```

1  $\langle *2ekernel | tex | latexrelease \rangle$ 
2  $\langle 2ekernel | latexrelease \rangle \ifx \directlua \@undefined \else$ 

```

### 5.1 Minimum LuaTeX version

LuaTeX has changed a lot over time. In the kernel support for ancient versions is not provided: trying to build a format with a very old binary therefore gives some information in the log and loading stops. The cut-off selected here relates to the tree-searching behaviour of `require()`: from version 0.60, LuaTeX will correctly find Lua files in the `texmf` tree without ‘help’.

```

3  $\langle latexrelease \rangle \includeinrelease{2015/10/01}$ 
4  $\langle latexrelease \rangle \qquad \qquad \qquad \{ \newluafunction \} \{ LuaTeX \} \%$ 
5  $\ifnum \luatexversion < 60 \%$ 
6  $\wlog \{ \text{*****} \}$ 
7  $\wlog \{ * \text{ LuaTeX version too old for l\luatex support } * \}$ 
8  $\wlog \{ \text{*****} \}$ 
9  $\expandafter \endinput$ 
10  $\fi$ 

```

Two simple L<sup>A</sup>T<sub>E</sub>X macros from `ltxdefns.dtx` have to be defined here because `ltxdefns.dtx` is not loaded yet when `l\luatex.dtx` is executed.

```

11  $\long\def \@gobble#1 \{ \}$ 
12  $\long\def \@firstofone#1 \{ \#1 \}$ 

```

### 5.2 Older L<sup>A</sup>T<sub>E</sub>X/Plain T<sub>E</sub>X setup

```

13  $\langle *tex \rangle$ 

```

Older L<sup>A</sup>T<sub>E</sub>X formats don’t have the primitives with ‘native’ names: sort that out. If they already exist this will still be safe.

```

14  $\directlua \{ tex.enableprimitives("", tex.extraprimitives("luatex")) \}$ 
15  $\ifx \e@alloc \@undefined$ 

```

In pre-2014 L<sup>A</sup>T<sub>E</sub>X, or plain T<sub>E</sub>X, load `etex.{sty,src}`.

```

16  $\ifx \documentclass \@undefined$ 
17  $\ifx \loccount \@undefined$ 

```



```

18      \input{etex.src}%
19      \fi
20      \catcode'\@=11 %
21      \outer\expandafter\def\csname newfam\endcsname
22          {\alloc@8\fam\chardef\et@xmaxfam}
23      \else
24      \RequirePackage{etex}
25      \expandafter\def\csname newfam\endcsname
26          {\alloc@8\fam\chardef\et@xmaxfam}
27      \expandafter\let\expandafter\new@mathgroup\csname newfam\endcsname
28      \fi

```

### 5.2.1 Fixes to etex.src/etex.sty

These could and probably should be made directly in an update to `etex.src` which already has some LuaTeX-specific code, but does not define the correct range for LuaTeX. 2015-07-13 higher range in luatex.

```

29 \edef \et@xmaxregs {\ifx\directlua\@undefined 32768\else 65536\fi}

```

luatex/xetex also allow more math fam.

```

30 \edef \et@xmaxfam {\ifx\Umathcode\@undefined\sixt@@n\else\@ccclvi\fi}
31 \count 270=\et@xmaxregs % locally allocates \count registers
32 \count 271=\et@xmaxregs % ditto for \dimen registers
33 \count 272=\et@xmaxregs % ditto for \skip registers
34 \count 273=\et@xmaxregs % ditto for \muskip registers
35 \count 274=\et@xmaxregs % ditto for \box registers
36 \count 275=\et@xmaxregs % ditto for \toks registers
37 \count 276=\et@xmaxregs % ditto for \marks classes

```

and 256 or 16 fam. (Done above due to plain/L<sup>A</sup>T<sub>E</sub>X differences in l<sup>A</sup>uatex.)

```

38 % \outer\def\newfam{\alloc@8\fam\chardef\et@xmaxfam}
    End of proposed changes to etex.src

```

### 5.2.2 luatex specific settings

Switch to global cf `luatex.sty` to leave room for inserts not really needed for luatex but possibly most compatible with existing use.

```

39 \expandafter\let\csname newcount\expandafter\expandafter\endcsname
    \csname globcount\endcsname
40 \expandafter\let\csname newdimen\expandafter\expandafter\endcsname
    \csname globdimen\endcsname
41 \expandafter\let\csname newskip\expandafter\expandafter\endcsname
    \csname globskip\endcsname
42 \expandafter\let\csname newbox\expandafter\expandafter\endcsname
    \csname globbox\endcsname
43 \expandafter\let\csname newbox\expandafter\expandafter\endcsname
    \csname globbox\endcsname
44 \expandafter\let\csname newbox\expandafter\expandafter\endcsname
    \csname globbox\endcsname
45 \expandafter\let\csname newbox\expandafter\expandafter\endcsname
    \csname globbox\endcsname
46 \expandafter\let\csname newbox\expandafter\expandafter\endcsname
    \csname globbox\endcsname

```

Define `\e@alloc` as in latex (the existing macros in `etex.src` hard to extend to further register types as they assume specific 26x and 27x count range. For compatibility the existing register allocation is not changed.

```

47 \chardef\e@alloc@top=65535
48 \let\e@alloc\chardef\chardef

```

```

49 \def\@alloc#1#2#3#4#5#6{%
50   \global\advance#3\@ne
51   \e@ch@ck{#3}{#4}{#5}#1%
52   \allocationnumber#3\relax
53   \global#2#6\allocationnumber
54   \wlog{\string#6=\string#1\the\allocationnumber}}%

55 \gdef\@ch@ck#1#2#3#4{%
56   \ifnum#1<#2\else
57     \ifnum#1=#2\relax
58       #1\@ccclvi
59       \ifx\count#4\advance#1 10 \fi
60     \fi
61     \ifnum#1<#3\relax
62     \else
63       \errmessage{No room for a new \string#4}%
64     \fi
65   \fi}%

```

Fix up allocations not to clash with `etex.src`.

```

66 \expandafter\csname newcount\endcsname\@alloc@attribute@count
67 \expandafter\csname newcount\endcsname\@alloc@ccodetable@count
68 \expandafter\csname newcount\endcsname\@alloc@luafunction@count
69 \expandafter\csname newcount\endcsname\@alloc@whatsit@count
70 \expandafter\csname newcount\endcsname\@alloc@bytecode@count
71 \expandafter\csname newcount\endcsname\@alloc@luachunk@count

```

End of conditional setup for plain T<sub>E</sub>X / old L<sup>A</sup>T<sub>E</sub>X.

```

72 \fi
73 \</tex>

```

### 5.3 Attributes

`\newattribute` As is generally the case for the LuaT<sub>E</sub>X registers we start here from 1. Notably, some code assumes that `\attribute0` is never used so this is important in this case.

```

74 \ifx\@alloc@attribute@count\@undefined
75   \countdef\@alloc@attribute@count=258
76   \@alloc@attribute@count=\z@
77 \fi
78 \def\newattribute#1{%
79   \e@alloc@attribute\attributedef
80   \e@alloc@attribute@count\m@ne\@alloc@top#1%
81 }

```

(End definition for `\newattribute`.)

`\setattribute` Handy utilities.  
`\unsetattribute`

```

82 \def\setattribute#1#2{#1=\numexpr#2\relax}
83 \def\unsetattribute#1{#1=-"7FFFFFFF\relax}

```

(End definition for `\setattribute` and `\unsetattribute`.)

## 5.4 Category code tables

`\newcatcodetable` Category code tables are allocated with a limit half of that used by LuaTeX for everything else. At the end of allocation there needs to be an initialization step. Table 0 is already taken (it's the global one for current use) so the allocation starts at 1.

```

84 \ifx\@alloc@ccodetable@count\@undefined
85   \countdef\@alloc@ccodetable@count=259
86   \@alloc@ccodetable@count=\z@
87 \fi
88 \def\newcatcodetable#1{%
89   \@alloc\catcodetable\chardef
90   \@alloc@ccodetable@count\m@ne{"8000}#1%
91   \initcatcodetable\allocationnumber
92 }

```

(End definition for `\newcatcodetable`.)

`\catcodetable@initex` Save a small set of standard tables. The Unicode data is read here in using a parser simplified from that in `load-unicode-data`: only the nature of letters needs to be detected.

```

\catcodetable@string
\catcodetable@latex
\catcodetable@atletter
93 \newcatcodetable\catcodetable@initex
94 \newcatcodetable\catcodetable@string
95 \begingroup
96   \def\setrangecatcode#1#2#3{%
97     \ifnum#1>#2 %
98       \expandafter\@gobble
99     \else
100       \expandafter\@firstofone
101     \fi
102     {%
103       \catcode#1=#3 %
104       \expandafter\setrangecatcode\expandafter
105       {\number\numexpr#1 + 1\relax}{#2}{#3}
106     }%
107   }
108   \@firstofone{%
109     \catcodetable\catcodetable@initex
110     \catcode0=12 %
111     \catcode13=12 %
112     \catcode37=12 %
113     \setrangecatcode{65}{90}{12}%
114     \setrangecatcode{97}{122}{12}%
115     \catcode92=12 %
116     \catcode127=12 %
117     \savecatcodetable\catcodetable@string
118   \endgroup
119 }%
120 \newcatcodetable\catcodetable@latex
121 \newcatcodetable\catcodetable@atletter
122 \begingroup
123   \def\parseunicodedataI#1;#2;#3;#4\relax{%
124     \parseunicodedataII#1;#3;#2 First>\relax
125   }%
126   \def\parseunicodedataII#1;#2;#3 First>#4\relax{%
127     \ifx\relax#4\relax

```

```

128     \expandafter\parseunicodedataIII
129     \else
130     \expandafter\parseunicodedataIV
131     \fi
132     {#1}#2\relax%
133 }%
134 \def\parseunicodedataIII#1#2#3\relax{%
135     \ifnum 0%
136     \if L#21\fi
137     \if M#21\fi
138     >0 %
139     \catcode"#1=11 %
140     \fi
141 }%
142 \def\parseunicodedataIV#1#2#3\relax{%
143     \read\unicoderead to \unicodedataline
144     \if L#2%
145     \count0="#1 %
146     \expandafter\parseunicodedataV\unicodedataline\relax
147     \fi
148 }%
149 \def\parseunicodedataV#1;#2\relax{%
150     \loop
151     \unless\ifnum\count0>"#1 %
152     \catcode\count0=11 %
153     \advance\count0 by 1 %
154     \repeat
155 }%
156 \def\storedpar{\par}%
157 \chardef\unicoderead=\numexpr\count16 + 1\relax
158 \openin\unicoderead=UnicodeData.txt %
159 \loop\unless\ifeof\unicoderead %
160     \read\unicoderead to \unicodedataline
161     \unless\ifx\unicodedataline\storedpar
162     \expandafter\parseunicodedataI\unicodedataline\relax
163     \fi
164     \repeat
165 \closein\unicoderead
166 \@firstofone{%
167     \catcode64=12 %
168     \savecatcodetable\catcodetable@latex
169     \catcode64=11 %
170     \savecatcodetable\catcodetable@atletter
171 }
172 \endgroup

```

(End definition for \catcodetable@initex and others.)

## 5.5 Named Lua functions

`\newluafunction` Much the same story for allocating LuaTeX functions except here they are just numbers so they are allocated in the same way as boxes. Lua indexes from 1 so once again slot 0 is skipped.

```

173 \ifx\e@alloc@luafunction@count\undefined

```

```

174 \countdef\@alloc@luafunction@count=260
175 \e@alloc@luafunction@count=\z@
176 \fi
177 \def\newluafunction{%
178 \e@alloc@luafunction\@alloc@chardef
179 \e@alloc@luafunction@count\m@ne\@alloc@top
180 }

```

*(End definition for \newluafunction.)*

`\newluacmd` Additionally two variants are provided to make the passed control sequence call the  
`\newprotectedluacmd` function directly.

```

181 \def\newluacmd{%
182 \e@alloc@luafunction\luaodef
183 \e@alloc@luafunction@count\m@ne\@alloc@top
184 }
185 \def\newprotectedluacmd{%
186 \e@alloc@luafunction{\protected\luaodef}
187 \e@alloc@luafunction@count\m@ne\@alloc@top
188 }

```

*(End definition for \newluacmd and \newprotectedluacmd.)*

## 5.6 Custom whatsits

`\newwhatsit` These are only settable from Lua but for consistency are definable here.

```

189 \ifx\@alloc@whatsit@count\@undefined
190 \countdef\@alloc@whatsit@count=261
191 \e@alloc@whatsit@count=\z@
192 \fi
193 \def\newwhatsit#1{%
194 \e@alloc@whatsit\@alloc@chardef
195 \e@alloc@whatsit@count\m@ne\@alloc@top#1%
196 }

```

*(End definition for \newwhatsit.)*

## 5.7 Lua bytecode registers

`\newluabytcode` These are only settable from Lua but for consistency are definable here.

```

197 \ifx\@alloc@bytecode@count\@undefined
198 \countdef\@alloc@bytecode@count=262
199 \e@alloc@bytecode@count=\z@
200 \fi
201 \def\newluabytcode#1{%
202 \e@alloc@luabytcode\@alloc@chardef
203 \e@alloc@bytecode@count\m@ne\@alloc@top#1%
204 }

```

*(End definition for \newluabytcode.)*

## 5.8 Lua chunk registers

`\newluachunkname` As for bytecode registers, but in addition we need to add a string to the `lua.name` table to use in stack tracing. We use the name of the command passed to the allocator, with no backslash.

```

205 \ifx\@alloc@luachunk@count\@undefined
206   \countdef\@alloc@luachunk@count=263
207   \@alloc@luachunk@count=\z@
208 \fi
209 \def\newluachunkname#1{%
210   \@alloc@luachunk\@alloc@chardef
211   \@alloc@luachunk@count\m@ne\@alloc@top#1%
212   {\escapechar\m@ne
213    \directlua{lua.name[\the\allocationnumber]="\string#1"}}%
214 }
```

(End definition for `\newluachunkname`.)

## 5.9 Lua loader

Lua code loaded in the format often has to be loaded again at the beginning of every job, so we define a helper which allows us to avoid duplicated code:

```

215 \def\now@and@everyjob#1{%
216   \everyjob\expandafter{\the\everyjob
217     #1%
218   }%
219   #1%
220 }
```

Load the Lua code at the start of every job. For the conversion of T<sub>E</sub>X into numbers at the Lua side we need some known registers: for convenience we use a set of systematic names, which means using a group around the Lua loader.

```

221 <2kernel>\now@and@everyjob{%
222   \begingroup
223     \attributedef\attributezero=0 %
224     \chardef      \charzero      =0 %
225     \countdef     \CountZero     =0 %
226     \dimendef     \dimenzero     =0 %
227     \mathchardef  \mathcharzero =0 %
228     \muskipdef    \muskipzero    =0 %
229     \skipdef      \skipzero      =0 %
230     \toksdef      \tokszero      =0 %
231     \directlua{require("ltnlua")}
```

232 \endgroup

233 <2kernel>}

234 <latexrelease>\EndIncludeInRelease

235 <latexrelease>\IncludeInRelease{0000/00/00}

236 <latexrelease>{\newluafunction}{LuaTeX}%

237 <latexrelease>\let\@alloc@attribute@count\@undefined

238 <latexrelease>\let\newattribute\@undefined

239 <latexrelease>\let\setattribute\@undefined

```

240 <latexrelease>\let\unsetattribute\@undefined
241 <latexrelease>\let\@alloc@ccodetable@count\@undefined
242 <latexrelease>\let\newcatcodetable\@undefined
243 <latexrelease>\let\catcodetable@initex\@undefined
244 <latexrelease>\let\catcodetable@string\@undefined
245 <latexrelease>\let\catcodetable@latex\@undefined
246 <latexrelease>\let\catcodetable@atletter\@undefined
247 <latexrelease>\let\@alloc@luafunction@count\@undefined
248 <latexrelease>\let\newluafunction\@undefined
249 <latexrelease>\let\@alloc@luafunction@count\@undefined
250 <latexrelease>\let\newwhatsit\@undefined
251 <latexrelease>\let\@alloc@whatsit@count\@undefined
252 <latexrelease>\let\newluabytecode\@undefined
253 <latexrelease>\let\@alloc@bytecode@count\@undefined
254 <latexrelease>\let\newluachunkname\@undefined
255 <latexrelease>\let\@alloc@luachunk@count\@undefined
256 <latexrelease>\directlua{luatexbase.uninstall()}
257 <latexrelease>\EndIncludeInRelease

```

In `\everyjob`, if `luaotfload` is available, load it and switch to TU.

```

258 <latexrelease>\IncludeInRelease{2017/01/01}%
259 <latexrelease>{\fontencoding}{TU in everyjob}%
260 <latexrelease>\fontencoding{TU}\let\encodingdefault\fontencoding
261 <latexrelease>\ifx\directlua\@undefined\else
262 <2kernel>\everyjob\expandafter{%
263 <2kernel> \the\everyjob
264 <*2kernel, latexrelease>
265 \directlua{%
266 if xpcall(function ()%
267 require('luaotfload-main')%
268 end, texio.write_nl) then %
269 local _void = luaotfload.main ()%
270 else %
271 texio.write_nl('Error in luaotfload: reverting to OT1')%
272 tex.print('\string\def\string\encodingdefault{OT1}')%
273 end %
274 }%
275 \let\fontencoding\encodingdefault
276 \expandafter\let\csname ver@luaotfload.sty\endcsname\fmtversion
277 </2kernel, latexrelease>
278 <latexrelease>\fi
279 <2kernel> }
280 <latexrelease>\EndIncludeInRelease
281 <latexrelease>\IncludeInRelease{0000/00/00}%
282 <latexrelease>{\fontencoding}{TU in everyjob}%
283 <latexrelease>\fontencoding{OT1}\let\encodingdefault\fontencoding
284 <latexrelease>\EndIncludeInRelease
285 <2kernel | latexrelease>\fi
286 </2kernel | tex | latexrelease>

```

## 5.10 Lua module preliminaries

```

287 <*lua>

```

Some set up for the Lua module which is needed for all of the Lua functionality added here.

**luatexbase** Set up the table for the returned functions. This is used to expose all of the public functions.

```
288 luatexbase      = luatexbase or { }
289 local luatexbase = luatexbase
```

*(End definition for luatexbase.)*

Some Lua best practice: use local versions of functions where possible.

```
290 local string_gsub      = string.gsub
291 local tex_count        = tex.count
292 local tex_setattribute = tex.setattribute
293 local tex_setcount     = tex.setcount
294 local texio_write_nl   = texio.write_nl
295 local flush_list      = node.flush_list

296 local luatexbase_warning
297 local luatexbase_error
```

## 5.11 Lua module utilities

### 5.11.1 Module tracking

**modules** To allow tracking of module usage, a structure is provided to store information and to return it.

```
298 local modules = modules or { }
```

*(End definition for modules.)*

**provides\_module** Local function to write to the log.

```
299 local function luatexbase_log(text)
300   texio_write_nl("log", text)
301 end
```

Modelled on `\ProvidesPackage`, we store much the same information but with a little more structure.

```
302 local function provides_module(info)
303   if not (info and info.name) then
304     luatexbase_error("Missing module name for provides_module")
305   end
306   local function spaced(text)
307     return text and (" " .. text) or ""
308   end
309   luatexbase_log(
310     "Lua module: " .. info.name
311     .. spaced(info.date)
312     .. spaced(info.version)
313     .. spaced(info.description)
314   )
315   modules[info.name] = info
316 end
317 luatexbase.provides_module = provides_module
```

*(End definition for provides\_module.)*



### 5.11.2 Module messages

There are various warnings and errors that need to be given. For warnings we can get exactly the same formatting as from  $\text{\TeX}$ . For errors we have to make some changes. Here we give the text of the error in the  $\text{\LaTeX}$  format then force an error from Lua to halt the run. Splitting the message text is done using `\n` which takes the place of `\MessageBreak`.

First an auxiliary for the formatting: this measures up the message leader so we always get the correct indent.

```

318 local function msg_format(mod, msg_type, text)
319   local leader = ""
320   local cont
321   local first_head
322   if mod == "LaTeX" then
323     cont = string_gsub(leader, ".", " ")
324     first_head = leader .. "LaTeX: "
325   else
326     first_head = leader .. "Module " .. msg_type
327     cont = "(" .. mod .. ")"
328     .. string_gsub(first_head, ".", " ")
329     first_head = leader .. "Module " .. mod .. " " .. msg_type .. ":"
330   end
331   if msg_type == "Error" then
332     first_head = "\n" .. first_head
333   end
334   if string.sub(text,-1) ~= "\n" then
335     text = text .. " "
336   end
337   return first_head .. " "
338     .. string_gsub(
339       text
340     .. "on input line "
341       .. tex.inputlineno, "\n", "\n" .. cont .. " "
342     )
343   .. "\n"
344 end

```

```

module_info Write messages.
module_warning
module_error
345 local function module_info(mod, text)
346   texio_write_nl("log", msg_format(mod, "Info", text))
347 end
348 luatexbase.module_info = module_info
349 local function module_warning(mod, text)
350   texio_write_nl("term and log", msg_format(mod, "Warning", text))
351 end
352 luatexbase.module_warning = module_warning
353 local function module_error(mod, text)
354   error(msg_format(mod, "Error", text))
355 end
356 luatexbase.module_error = module_error

```

*(End definition for module\_info, module\_warning, and module\_error.)*

Dedicated versions for the rest of the code here.

```

357 function luatexbase_warning(text)
358   module_warning("luatexbase", text)
359 end
360 function luatexbase_error(text)
361   module_error("luatexbase", text)
362 end

```

## 5.12 Accessing register numbers from Lua

Collect up the data from the T<sub>E</sub>X level into a Lua table: from version 0.80, LuaT<sub>E</sub>X makes that easy.

```

363 local luaregisterbasetable = { }
364 local registermap = {
365   attributezero = "assign_attr"   ,
366   charzero      = "char_given"    ,
367   CountZero     = "assign_int"    ,
368   dimenzero     = "assign_dimen"  ,
369   mathcharzero  = "math_given"    ,
370   muskipzero    = "assign_mu_skip",
371   skipzero      = "assign_skip"   ,
372   tokszero      = "assign_toks"   ,
373 }
374 local createtoken
375 if tex.luatexversion > 81 then
376   createtoken = token.create
377 elseif tex.luatexversion > 79 then
378   createtoken = newtoken.create
379 end
380 local hashtokens = tex.hashtokens()
381 local luatexversion = tex.luatexversion
382 for i,j in pairs (registermap) do
383   if luatexversion < 80 then
384     luaregisterbasetable[hashtokens[i][1]] =
385       hashtokens[i][2]
386   else
387     luaregisterbasetable[j] = createtoken(i).mode
388   end
389 end

```

**registernumber** Working out the correct return value can be done in two ways. For older LuaT<sub>E</sub>X releases it has to be extracted from the `hashtokens`. On the other hand, newer LuaT<sub>E</sub>X's have `newtoken`, and whilst `.mode` isn't currently documented, Hans Hagen pointed to this approach so we should be OK.

```

390 local registernumber
391 if luatexversion < 80 then
392   function registernumber(name)
393     local nt = hashtokens[name]
394     if (nt and luaregisterbasetable[nt[1]]) then
395       return nt[2] - luaregisterbasetable[nt[1]]
396     else
397       return false
398     end
399   end

```

```

400 else
401   function registernumber(name)
402     local nt = createtoken(name)
403     if(luaregisterbasetable[nt.cmdname]) then
404       return nt.mode - luaregisterbasetable[nt.cmdname]
405     else
406       return false
407     end
408   end
409 end
410 luatexbase.registernumber = registernumber

```

*(End definition for registernumber.)*

### 5.13 Attribute allocation

**new\_attribute** As attributes are used for Lua manipulations its useful to be able to assign from this end.

```

411 local attributes=setmetatable(
412   {},
413   {
414     __index = function(t,key)
415       return registernumber(key) or nil
416     end}
417 )
418 luatexbase.attributes = attributes
419
419 local attribute_count_name =
420   attribute_count_name or "e@alloc@attribute@count"
421 local function new_attribute(name)
422   tex_setcount("global", attribute_count_name,
423     tex_count[attribute_count_name] + 1)
424   if tex_count[attribute_count_name] > 65534 then
425     luatexbase_error("No room for a new \\attribute")
426   end
427   attributes[name]= tex_count[attribute_count_name]
428   luatexbase_log("Lua-only attribute " .. name .. " = " ..
429     tex_count[attribute_count_name])
430   return tex_count[attribute_count_name]
431 end
432 luatexbase.new_attribute = new_attribute

```

*(End definition for new\_attribute.)*

### 5.14 Custom whatsit allocation

**new\_whatsit** Much the same as for attribute allocation in Lua.

```

433 local whatsit_count_name = whatsit_count_name or "e@alloc@whatsit@count"
434 local function new_whatsit(name)
435   tex_setcount("global", whatsit_count_name,
436     tex_count[whatsit_count_name] + 1)
437   if tex_count[whatsit_count_name] > 65534 then
438     luatexbase_error("No room for a new custom whatsit")
439   end
440   luatexbase_log("Custom whatsit " .. (name or "") .. " = " ..

```

```

441         tex_count[whatsit_count_name])
442     return tex_count[whatsit_count_name]
443 end
444 luatexbase.new_whatsit = new_whatsit

```

*(End definition for new\_whatsit.)*

## 5.15 Bytecode register allocation

**new\_bytecode** Much the same as for attribute allocation in Lua. The optional  $\langle name \rangle$  argument is used in the log if given.

```

445 local bytecode_count_name =
446     bytecode_count_name or "e@alloc@bytecode@count"
447 local function new_bytecode(name)
448     tex_setcount("global", bytecode_count_name,
449         tex_count[bytecode_count_name] + 1)
450     if tex_count[bytecode_count_name] > 65534 then
451         luatexbase_error("No room for a new bytecode register")
452     end
453     luatexbase_log("Lua bytecode " .. (name or "") .. " = " ..
454         tex_count[bytecode_count_name])
455     return tex_count[bytecode_count_name]
456 end
457 luatexbase.new_bytecode = new_bytecode

```

*(End definition for new\_bytecode.)*

## 5.16 Lua chunk name allocation

**new\_chunkname** As for bytecode registers but also store the name in the lua.name table.

```

458 local chunkname_count_name =
459     chunkname_count_name or "e@alloc@luachunk@count"
460 local function new_chunkname(name)
461     tex_setcount("global", chunkname_count_name,
462         tex_count[chunkname_count_name] + 1)
463     local chunkname_count = tex_count[chunkname_count_name]
464     chunkname_count = chunkname_count + 1
465     if chunkname_count > 65534 then
466         luatexbase_error("No room for a new chunkname")
467     end
468     lua.name[chunkname_count]=name
469     luatexbase_log("Lua chunkname " .. (name or "") .. " = " ..
470         chunkname_count .. "\n")
471     return chunkname_count
472 end
473 luatexbase.new_chunkname = new_chunkname

```

*(End definition for new\_chunkname.)*

## 5.17 Lua function allocation

`new_luafunction` Much the same as for attribute allocation in Lua. The optional  $\langle name \rangle$  argument is used in the log if given.

```
474 local luafunction_count_name =  
475     luafunction_count_name or "e@alloc@luafunction@count"  
476 local function new_luafunction(name)  
477     tex_setcount("global", luafunction_count_name,  
478         tex_count[luafunction_count_name] + 1)  
479     if tex_count[luafunction_count_name] > 65534 then  
480         luatexbase_error("No room for a new luafunction register")  
481     end  
482     luatexbase_log("Lua function " .. (name or "") .. " = " ..  
483         tex_count[luafunction_count_name])  
484     return tex_count[luafunction_count_name]  
485 end  
486 luatexbase.new_luafunction = new_luafunction
```

(End definition for `new_luafunction`.)

## 5.18 Lua callback management

The native mechanism for callbacks in LuaTeX allows only one per function. That is extremely restrictive and so a mechanism is needed to add and remove callbacks from the appropriate hooks.

### 5.18.1 Housekeeping

The main table: keys are callback names, and values are the associated lists of functions. More precisely, the entries in the list are tables holding the actual function as `func` and the identifying description as `description`. Only callbacks with a non-empty list of functions have an entry in this list.

```
487 local callbacklist = callbacklist or { }
```

Numerical codes for callback types, and name-to-value association (the table keys are strings, the values are numbers).

```
488 local list, data, exclusive, simple, reverselist = 1, 2, 3, 4, 5  
489 local types = {  
490     list      = list,  
491     data      = data,  
492     exclusive = exclusive,  
493     simple    = simple,  
494     reverselist = reverselist,  
495 }
```

Now, list all predefined callbacks with their current type, based on the LuaTeX manual version 1.01. A full list of the currently-available callbacks can be obtained using

```
\directlua{  
    for i,_ in pairs(callback.list()) do  
        texio.write_nl("- " .. i)  
    end  
}  
\bye
```

in plain Lua<sub>T</sub><sub>E</sub>X. (Some undocumented callbacks are omitted as they are to be removed.)

```
496 local callbacktypes = callbacktypes or {
```

Section 8.2: file discovery callbacks.

```
497 find_read_file      = exclusive,
498 find_write_file     = exclusive,
499 find_font_file      = data,
500 find_output_file    = data,
501 find_format_file    = data,
502 find_vf_file        = data,
503 find_map_file       = data,
504 find_enc_file       = data,
505 find_pk_file        = data,
506 find_data_file      = data,
507 find_opentype_file  = data,
508 find_truetype_file  = data,
509 find_type1_file     = data,
510 find_image_file     = data,
```

```
511 open_read_file      = exclusive,
512 read_font_file      = exclusive,
513 read_vf_file        = exclusive,
514 read_map_file       = exclusive,
515 read_enc_file       = exclusive,
516 read_pk_file        = exclusive,
517 read_data_file      = exclusive,
518 read_truetype_file  = exclusive,
519 read_type1_file     = exclusive,
520 read_opentype_file  = exclusive,
```

Not currently used by luatex but included for completeness. may be used by a font handler.

```
521 find_cidmap_file    = data,
522 read_cidmap_file    = exclusive,
```

Section 8.3: data processing callbacks.

```
523 process_input_buffer = data,
524 process_output_buffer = data,
525 process_jobname      = data,
```

Section 8.4: node list processing callbacks.

```
526 contribute_filter   = simple,
527 buildpage_filter    = simple,
528 build_page_insert   = exclusive,
529 pre_linebreak_filter = list,
530 linebreak_filter     = exclusive,
531 append_to_vlist_filter = exclusive,
532 post_linebreak_filter = reverselist,
533 hpack_filter         = list,
534 vpack_filter         = list,
535 hpack_quality        = exclusive,
536 vpack_quality        = exclusive,
537 pre_output_filter    = list,
538 process_rule         = exclusive,
539 hyphenate            = simple,
```

```

540   ligaturing           = simple,
541   kerning             = simple,
542   insert_local_par    = simple,
543   pre_mlist_to_hlist_filter = list,
544   mlist_to_hlist      = exclusive,
545   post_mlist_to_hlist_filter = reverselist,
546   new_graf            = exclusive,

```

Section 8.5: information reporting callbacks.

```

547   pre_dump            = simple,
548   start_run           = simple,
549   stop_run            = simple,
550   start_page_number   = simple,
551   stop_page_number    = simple,
552   show_error_hook     = simple,
553   show_warning_message = simple,
554   show_error_message  = simple,
555   show_lua_error_hook = simple,
556   start_file          = simple,
557   stop_file           = simple,
558   call_edit           = simple,
559   finish_synctex      = simple,
560   wrapup_run          = simple,

```

Section 8.6: PDF-related callbacks.

```

561   finish_pdffile      = data,
562   finish_pdfpage      = data,
563   page_objnum_provider = data,
564   page_order_index    = data,
565   process_pdf_image_content = data,

```

Section 8.7: font-related callbacks.

```

566   define_font          = exclusive,
567   glyph_info           = exclusive,
568   glyph_not_found      = exclusive,
569   glyph_stream_provider = exclusive,
570   make_extensible      = exclusive,
571   font_descriptor_objnum_provider = exclusive,
572   input_level_string    = exclusive,
573   provide_charproc_data = exclusive,
574 }
575 luatexbase.callbacktypes=callbacktypes

```

**callback.register** Save the original function for registering callbacks and prevent the original being used. The original is saved in a place that remains available so other more sophisticated code can override the approach taken by the kernel if desired.

```

576 local callback_register = callback_register or callback.register
577 function callback.register()
578   luatexbase_error("Attempt to use callback.register() directly\n")
579 end

```

*(End definition for callback.register.)*

### 5.18.2 Handlers

The handler function is registered into the callback when the first function is added to this callback's list. Then, when the callback is called, the handler takes care of running all functions in the list. When the last function is removed from the callback's list, the handler is unregistered.

More precisely, the functions below are used to generate a specialized function (closure) for a given callback, which is the actual handler.

The way the functions are combined together depends on the type of the callback. There are currently 4 types of callback, depending on the calling convention of the functions the callback can hold:

**simple** is for functions that don't return anything: they are called in order, all with the same argument;

**data** is for functions receiving a piece of data of any type except node list head (and possibly other arguments) and returning it (possibly modified): the functions are called in order, and each is passed the return value of the previous (and the other arguments untouched, if any). The return value is that of the last function;

**list** is a specialized variant of *data* for functions filtering node lists. Such functions may return either the head of a modified node list, or the boolean values **true** or **false**. The functions are chained the same way as for *data* except that for the following. If one function returns **false**, then **false** is immediately returned and the following functions are *not* called. If one function returns **true**, then the same head is passed to the next function. If all functions return **true**, then **true** is returned, otherwise the return value of the last function not returning **true** is used.

**reverselist** is a specialized variant of *list* which executes functions in inverse order.

**exclusive** is for functions with more complex signatures; functions in this type of callback are *not* combined: An error is raised if a second callback is registered.

Handler for **data** callbacks.

```
580 local function data_handler(name)
581   return function(data, ...)
582     for _,i in ipairs(callbacklist[name]) do
583       data = i.func(data,...)
584     end
585     return data
586   end
587 end
```

Default for user-defined **data** callbacks without explicit default.

```
588 local function data_handler_default(value)
589   return value
590 end
```

Handler for **exclusive** callbacks. We can assume `callbacklist[name]` is not empty: otherwise, the function wouldn't be registered in the callback any more.

```
591 local function exclusive_handler(name)
592   return function(...)
593     return callbacklist[name][1].func(...)
594   end
595 end
```



Handler for list callbacks.

```
596 local function list_handler(name)
597   return function(head, ...)
598     local ret
599     for _,i in ipairs(callbacklist[name]) do
600       ret = i.func(head, ...)
601       if ret == false then
602         luatexbase_warning(
603           "Function '" .. i.description .. "' returned false\n"
604           .. "in callback '" .. name .. "'")
605       )
606       return false
607     end
608     if ret ~= true then
609       head = ret
610     end
611   end
612   return head
613 end
614 end
```

Default for user-defined list and reverselist callbacks without explicit default.

```
615 local function list_handler_default(head)
616   return head
617 end
```

Handler for reverselist callbacks.

```
618 local function reverselist_handler(name)
619   return function(head, ...)
620     local ret
621     local callbacks = callbacklist[name]
622     for i = #callbacks, 1, -1 do
623       local cb = callbacks[i]
624       ret = cb.func(head, ...)
625       if ret == false then
626         luatexbase_warning(
627           "Function '" .. cb.description .. "' returned false\n"
628           .. "in callback '" .. name .. "'")
629       )
630       return false
631     end
632     if ret ~= true then
633       head = ret
634     end
635   end
636   return head
637 end
638 end
```

Handler for simple callbacks.

```
639 local function simple_handler(name)
640   return function(...)
641     for _,i in ipairs(callbacklist[name]) do
642       i.func(...)
643     end
644   end
645 end
```

```

644 end
645 end

```

Default for user-defined `simple` callbacks without explicit default.

```

646 local function simple_handler_default()
647 end

```

Keep a handlers table for indexed access and a table with the corresponding default functions.

```

648 local handlers = {
649   [data]      = data_handler,
650   [exclusive] = exclusive_handler,
651   [list]      = list_handler,
652   [reverselist] = reverselist_handler,
653   [simple]     = simple_handler,
654 }
655 local defaults = {
656   [data]      = data_handler_default,
657   [exclusive] = nil,
658   [list]      = list_handler_default,
659   [reverselist] = list_handler_default,
660   [simple]     = simple_handler_default,
661 }

```

### 5.18.3 Public functions for callback management

Defining user callbacks perhaps should be in package code, but impacts on `add_to_callback`. If a default function is not required, it may be declared as `false`. First we need a list of user callbacks.

```

662 local user_callbacks_defaults = {
663   pre_mlist_to_hlist_filter = list_handler_default,
664   mlist_to_hlist = node.mlist_to_hlist,
665   post_mlist_to_hlist_filter = list_handler_default,
666 }

```

`create_callback` The allocator itself.

```

667 local function create_callback(name, ctype, default)
668   local ctype_id = types[ctype]
669   if not name or name == ""
670   or not ctype_id
671   then
672     luatexbase_error("Unable to create callback:\n" ..
673                       "valid callback name and type required")
674   end
675   if callbacktypes[name] then
676     luatexbase_error("Unable to create callback '" .. name ..
677                       "':\ncallback is already defined")
678   end
679   default = default or defaults[ctype_id]
680   if not default then
681     luatexbase_error("Unable to create callback '" .. name ..
682                       "':\ndefault is required for '" .. ctype ..
683                       "' callbacks")
684   elseif type (default) ~= "function" then

```

```

685     luatexbase_error("Unable to create callback '" .. name ..
686                       "':\ndefault is not a function")
687   end
688   user_callbacks_defaults[name] = default
689   callbacktypes[name] = ctype_id
690 end
691 luatexbase.create_callback = create_callback

```

(End definition for create\_callback.)

**call\_callback** Call a user defined callback. First check arguments.

```

692 local function call_callback(name,...)
693   if not name or name == "" then
694     luatexbase_error("Unable to create callback:\n" ..
695                       "valid callback name required")
696   end
697   if user_callbacks_defaults[name] == nil then
698     luatexbase_error("Unable to call callback '" .. name
699                       .. "':\nunknown or empty")
700   end
701   local l = callbacklist[name]
702   local f
703   if not l then
704     f = user_callbacks_defaults[name]
705   else
706     f = handlers[callbacktypes[name]](name)
707   end
708   return f(...)
709 end
710 luatexbase.call_callback=call_callback

```

(End definition for call\_callback.)

**add\_to\_callback** Add a function to a callback. First check arguments.

```

711 local function add_to_callback(name, func, description)
712   if not name or name == "" then
713     luatexbase_error("Unable to register callback:\n" ..
714                       "valid callback name required")
715   end
716   if not callbacktypes[name] or
717     type(func) ~= "function" or
718     not description or
719     description == "" then
720     luatexbase_error(
721       "Unable to register callback.\n\n"
722       .. "Correct usage:\n"
723       .. "add_to_callback(<callback>, <function>, <description>)"
724     )
725   end

```

Then test if this callback is already in use. If not, initialise its list and register the proper handler.

```

726   local l = callbacklist[name]
727   if l == nil then
728     l = { }
729     callbacklist[name] = l

```

If it is not a user defined callback use the primitive callback register.

```

730     if user_callbacks_defaults[name] == nil then
731         callback_register(name, handlers[callbacktypes[name]](name))
732     end
733 end

```

Actually register the function and give an error if more than one `exclusive` one is registered.

```

734     local f = {
735         func          = func,
736         description = description,
737     }
738     local priority = #l + 1
739     if callbacktypes[name] == exclusive then
740         if #l == 1 then
741             luatexbase_error(
742                 "Cannot add second callback to exclusive function\n'" ..
743                 name .. "'"")
744         end
745     end
746     table.insert(l, priority, f)

```

Keep user informed.

```

747     luatexbase_log(
748         "Inserting '" .. description .. "' at position "
749         .. priority .. " in '" .. name .. "'"")
750 )
751 end
752 luatexbase.add_to_callback = add_to_callback

```

*(End definition for add\_to\_callback.)*

`remove_from_callback` Remove a function from a callback. First check arguments.

```

753 local function remove_from_callback(name, description)
754     if not name or name == "" then
755         luatexbase_error("Unable to remove function from callback:\n" ..
756             "valid callback name required")
757     end
758     if not callbacktypes[name] or
759         not description or
760         description == "" then
761         luatexbase_error(
762             "Unable to remove function from callback.\n\n"
763             .. "Correct usage:\n"
764             .. "remove_from_callback(<callback>, <description>)"
765         )
766     end
767     local l = callbacklist[name]
768     if not l then
769         luatexbase_error(
770             "No callback list for '" .. name .. "'\n")
771     end

```

Loop over the callback's function list until we find a matching entry. Remove it and check if the list is empty: if so, unregister the callback handler.

```

772 local index = false
773 for i,j in ipairs(l) do
774   if j.description == description then
775     index = i
776     break
777   end
778 end
779 if not index then
780   luatexbase_error(
781     "No callback '" .. description .. "' registered for '" ..
782     name .. "'\n")
783 end
784 local cb = l[index]
785 table.remove(l, index)
786 luatexbase_log(
787   "Removing '" .. description .. "' from '" .. name .. "'."
788 )
789 if #l == 0 then
790   callbacklist[name] = nil
791   if user_callbacks_defaults[name] == nil then
792     callback_register(name, nil)
793   end
794 end
795 return cb.func,cb.description
796 end
797 luatexbase.remove_from_callback = remove_from_callback

```

*(End definition for remove\_from\_callback.)*

**in\_callback** Look for a function description in a callback.

```

798 local function in_callback(name, description)
799   if not name
800     or name == ""
801     or not callbacklist[name]
802     or not callbacktypes[name]
803     or not description then
804     return false
805   end
806   for _, i in pairs(callbacklist[name]) do
807     if i.description == description then
808       return true
809     end
810   end
811   return false
812 end
813 luatexbase.in_callback = in_callback

```

*(End definition for in\_callback.)*

**disable\_callback** As we subvert the engine interface we need to provide a way to access this functionality.

```

814 local function disable_callback(name)
815   if(callbacklist[name] == nil) then
816     callback_register(name, false)
817   else
818     luatexbase_error("Callback list for " .. name .. " not empty")

```

```

819 end
820 end
821 luatexbase.disable_callback = disable_callback

```

(End definition for *disable\_callback*.)

**callback\_descriptions** List the descriptions of functions registered for the given callback.

```

822 local function callback_descriptions (name)
823   local d = {}
824   if not name
825     or name == ""
826     or not callbacklist[name]
827     or not callbacktypes[name]
828   then
829     return d
830   else
831     for k, i in pairs(callbacklist[name]) do
832       d[k] = i.description
833     end
834   end
835   return d
836 end
837 luatexbase.callback_descriptions = callback_descriptions

```

(End definition for *callback\_descriptions*.)

**uninstall** Unlike at the T<sub>E</sub>X level, we have to provide a back-out mechanism here at the same time as the rest of the code. This is not meant for use by anything other than *latexrelease*: as such this is *deliberately* not documented for users!

```

838 local function uninstall()
839   module_info(
840     "luatexbase",
841     "Uninstalling kernel luatexbase code"
842   )
843   callback.register = callback_register
844   luatexbase = nil
845 end
846 luatexbase.uninstall = uninstall

```

(End definition for *uninstall*.)

**mlist\_to\_hlist** To emulate these callbacks, the “real” *mlist\_to\_hlist* is replaced by a wrapper calling the wrappers before and after.

```

847 callback_register("mlist_to_hlist", function(head, display_type, need_penalties)
848   local current = call_callback("pre_mlist_to_hlist_filter", head, display_type, need_penalties)
849   if current == false then
850     flush_list(head)
851     return nil
852   end
853   current = call_callback("mlist_to_hlist", current, display_type, need_penalties)
854   local post = call_callback("post_mlist_to_hlist_filter", current, display_type, need_penalties)
855   if post == false then
856     flush_list(current)
857     return nil

```

```

858   end
859   return post
860 end)

(End definition for mlist_to_hlist.)

861 </lua>

      Reset the catcode of @.
862 <tex>\catcode'\@=\etatcatcode\relax

```

# File e

## ltxexpl.dtx

### 1 expl3-dependent code

#### 1.1 Loader

`\@kernel@after@endddocument`  
`\@kernel@after@endddocument@afterlastpage`

These two kernel hooks are used by the shipout code. They are defined earlier here because the `lthooks` code adds material to them.

```
1 <*2ekernel | latexrelease>
2 <latexrelease> \IncludeInRelease{2020/10/01}%
3 <latexrelease> {kernel@endddocument hooks}{Define several kernel hooks}
```

We only initialize these kernel hooks if they are not already existing. Otherwise they would be set to `\@empty` on rollback which would be wrong because code that has been added to them may still have to be executed in the rollback situation. Instead code that writes to them needs to handle the rollback as needed. It is likely that we have to change that approach in the future, but for now it should do. (It is enough to test only for the existence of one hook, as all got added at the same time.)

```
4 \ifx\@kernel@after@endddocument\undefined
5   \let \@kernel@after@endddocument \@empty
6   \let \@kernel@after@endddocument@afterlastpage \@empty
```

For the similar reasons we also define those that are used in `\document` because they too get material added to in early modules.

`\@kernel@before@begindocument`  
`\@kernel@after@begindocument`

```
7   \let \@kernel@before@begindocument \@empty
8   \let \@kernel@after@begindocument \@empty
9 \fi
10 <latexrelease> \EndIncludeInRelease
11 <latexrelease> \IncludeInRelease{0000/00/00}%
12 <latexrelease> {kernel@endddocument hooks}{Define several kernel hooks}
13 <latexrelease> \let \@kernel@after@endddocument\undefined
14 <latexrelease> \let \@kernel@after@endddocument@afterlastpage\undefined
15 <latexrelease> \let \@kernel@before@begindocument\undefined
16 <latexrelease> \let \@kernel@after@begindocument\undefined
17 </2ekernel | latexrelease>
18 <latexrelease> \EndIncludeInRelease
```

(End definition for `\@kernel@after@endddocument` and others.)

First define some blank commands, so that in case something goes wrong while loading `expl3`, we won't get strange Undefined control sequence errors.

```
19 <*2ekernel | latexrelease>
20 <latexrelease> \IncludeInRelease{2020/10/01}%
21 <latexrelease> {\@expl@sys@load@backend@@}{Roll forward support}%
22 \def\reserved@a#1{\ifdefined#1\else\def#1{}\fi}
23 \reserved@a\@expl@sys@load@backend@@
24 \reserved@a\@expl@push@filename@@
25 \reserved@a\@expl@push@filename@aux@@
26 \reserved@a\@expl@pop@filename@@
27 <latexrelease> \EndIncludeInRelease
28 </2ekernel | latexrelease>
```



Create a hook for last-minute expl3 material.

```

29 <*2kernel>
30 \def\@expl@finalise@setup@{
31 </2kernel>

```

Now define some basics to support loading expl3. These macros can be defined here safely, because they are redefined later on by the kernel, so we define simpler versions just to suit our needs.

```

32 <*2kernel>
33 \long\def\@gobble#1{}
34 \long\def\@firstofone#1{#1}
35 \long\def\@firstoftwo#1#2{#1}
36 \long\def\@secondoftwo#1#2{#2}
37 \long\def\IfFileExists#1{%
38   \openin\@inputcheck"#1" %
39   \ifeof\@inputcheck
40     \expandafter\@secondoftwo
41   \else
42     \closein\@inputcheck
43     \expandafter\@firstoftwo
44   \fi}
45 \long\def\@ifnextchar#1#2#3{%
46   \let\reserved@d=#1%
47   \def\reserved@a{#2}%
48   \def\reserved@b{#3}%
49   \futurelet\@let@token\@ifnch}
50 \def\@ifnch{%
51   \ifx\@let@token\reserved@d
52     \expandafter\reserved@a
53   \else
54     \expandafter\reserved@b
55   \fi}
56 </2kernel>

```

If we are doing a rollback with a format containing expl3 we aren't reloading it as that creates havoc. This may need a refined version!

```

57 <*2kernel | latexrelease>
58 <latexrelease> \IncludeInRelease{2020/10/01}%
59 <latexrelease> {expl3}{Pre-load expl3}%
60 \expandafter\ifx\csname tex\string _let:D\endcsname\relax
61   \expandafter\@firstofone
62 \else
63   \GenericInfo{}{Skipping: expl3 code already part of the format}%
64 <2kernel> \expandafter\endinput
65 <latexrelease> \expandafter\@gobble
66 \fi

```

Check for the required primitive/engine support and the existence of a loader.

```

67 {%
68   \IfFileExists{expl3.ltx}
69   {%
70     \ifnum0%
71       \ifdefined\pdffilesize 1\fi
72       \ifdefined\filesize 1\fi
73       \ifdefined\luatexversion\ifnum\luatexversion>94 1\fi\fi

```

```

74         \ifdefined\kanjiskip 1\fi
75         >0 %
76         \expandafter\@firstofone
77     \else

```

In 2ekernel mode, an error is fatal and building the format is aborted. Use `\batchmode \read -1 to \tokenlist`, which errors with

! Emergency stop. (cannot \read from terminal in nonstop modes)

and aborts the T<sub>E</sub>X run. In latexrelease mode, raise an error and do nothing. Both ways, the error message shows the minimum expl3 engine requirements.

```

78 <2ekernel>         \def~{ }\def\MessageBreak{^^J~~~~~}%
79 <2ekernel>         \errmessage{LaTeX Error:
80 <latexrelease>     \@latex@error{%
81                     LaTeX requires the e-TeX primitives and additional\MessageBreak
82                     functionality available in the engines:\MessageBreak
83                     - pdfTeX v1.40\MessageBreak
84                     - XeTeX v0.99992\MessageBreak
85                     - LuaTeX v0.95\MessageBreak
86                     - e-(u)pTeX mid-2012\MessageBreak
87                     or later%
88 <latexrelease>     } \@ehd \expandafter\@gobble
89 <2ekernel>         }\batchmode \read -1 to \reserved@a
90     \fi
91 }
92 {%
93 <*2ekernel>
94     \errmessage{LaTeX requires expl3}%
95     \batchmode \read -1 to \reserved@a
96 </2ekernel>

```

We do not support a roll forward across 2019. You need to start with 2019 if you want to get to 2020 or beyond.

```

97 <*latexrelease>
98     \@latex@warning@no@line
99     {You need a format that already contains a recent\MessageBreak
100     expl3 as part of the kernel, e.g. at least a kernel\MessageBreak
101     from 2019 to roll forward to that date!\MessageBreak
102     --- I'm giving up!\MessageBreak\MessageBreak
103     Note that manually loading the expl3 package\MessageBreak
104     from your distribution is not enough}%
105     \batchmode \read -1 to \reserved@a
106 </latexrelease>
107 }%
108 {\input expl3.ltx}%
109 }
110 <latexrelease>\EndIncludeInRelease
111 <latexrelease>

```

To support roll-forward for the case where xparse is fully integrated into the kernel, we do not need to repeat the complex test above as we can simply look for the marker command.

```

112 <latexrelease>\IncludeInRelease{2020/02/02}%
113 <latexrelease>     {expl3}{Pre-load expl3}%

```

```

114 <latexrelease>\IfFileExists{expl3.ltx}
115 <latexrelease> {%
116 <latexrelease>     \ifnum0%
117 <latexrelease>         \ifdefined\pdffilesize 1\fi
118 <latexrelease>         \ifdefined\filesize 1\fi
119 <latexrelease>         \ifdefined\luatexversion\ifnum\luatexversion>94 1\fi\fi
120 <latexrelease>         >0 %
121 <latexrelease>     \else
122 <latexrelease>         \message{Skipping expl3-dependent extensions}
123 <latexrelease>         \expandafter\@gobbletwo
124 <latexrelease>     \fi
125 <latexrelease> }
126 <latexrelease> {%
127 <latexrelease>     \message{Skipping expl3-dependent extensions}%
128 <latexrelease>     \@gobbletwo
129 <latexrelease> }%
130 <latexrelease>\input{expl3.ltx}
131 <latexrelease>\EndIncludeInRelease

```

Now in `latexrelease` mode, redefine a few commands to avoid “already defined” errors.

```

132 <latexrelease>\@ifundefined{ExplSyntaxOff}{\latexrelease@postltxexpl}

```

## 1.2 Using expl3 code

In order to ease the implementation of some new features in L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> we may (temporarily) use some coding based on the `expl3`-code. Such macros will eventually vanish and may be changed unannounced. They are there for internal use in the L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> kernel and are not meant to be used in third-party packages. These macros will always have the `@expl@` prefix in their name.

The rest of the name matches the `expl3` name but with all underscores replaced by `@s` and the `:` replaced by `@@`, e.g.,

```
\cs_new_eq:NN \@expl@tl@trim@spaces@apply@@nN \tl_trim_spaces_apply:nN
```

if that `expl3` command is needed in places that are others coded in L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> conventions.

In this file, each release of LaTeX adds an `\IncludeInRelease` block, in which the macros copied for that release were defined. In case a rollback is requested, the entire block is changed.

Each macro copied has a `\changes` entry to explain when and why it was copied, so that further to that may spot it easily.

Here `\cs_gset_eq:NN` is used, instead of the `new` variant because if different releases use that same name for different purposes, each can copy the macro without worrying about redefinitions.

```

133 <latexrelease>\IncludeInRelease{2020/10/01}{\@expl@cs@to@str@@N}%
134 <latexrelease>     {expl3 macros added for the 2020-10-01 release}%

```

The `expl3` activation needs to be inside the release guards as otherwise rolling forward is broken in old kernels that do not have `expl3` loaded.

```

135 \ExplSyntaxOn

136 \cs_gset_eq:NN \@expl@cs@to@str@@N \cs_to_str:N
137 \cs_gset_eq:NN \@expl@str@if@eq@@nnTF \str_if_eq:nnTF

```

```

138 \cs_gset_eq:NN \@expl@cs@prefix@spec@N \cs_prefix_spec:N
139 \cs_gset_eq:NN \@expl@cs@argument@spec@N \cs_argument_spec:N
140 \cs_gset_eq:NN \@expl@cs@replacement@spec@N \cs_replacement_spec:N

141 \cs_gset_eq:NN \@expl@str@map@function@N \str_map_function:N
142 \cs_gset_eq:NN \@expl@char@generate@nn \char_generate:nn
143 \ExplSyntaxOff

```

Here we can't assume that expl3 is available. It will be if we roll back but if this code is executed rolling forward it needs to be pure 2e.

```

144 \<latexrelease>\EndIncludeInRelease
145 \<latexrelease>\IncludeInRelease{0000/00/00}{\@expl@cs@to@str@N}%
146 \<latexrelease>\let \@expl@cs@to@str@N \@undefined
147 \<latexrelease>\let \@expl@str@if@eq@nnTF \@undefined
148 \<latexrelease>\let \@expl@cs@prefix@spec@N \@undefined
149 \<latexrelease>\let \@expl@cs@argument@spec@N \@undefined
150 \<latexrelease>\let \@expl@cs@replacement@spec@N \@undefined
151 \<latexrelease>\let \@expl@str@map@function@N \@undefined
152 \<latexrelease>\EndIncludeInRelease
153 \</2ekernel | latexrelease>

```

## 2 Document-level command names for expl3 functions

Current home for L3 programming layer functions that we make directly available at the document level. This section may need to be moved later (after `\NewDocumentCommand` is defined in case we want to use that in the setup).

`\fpeval` The expandable command `\fpeval` takes as its argument a floating point expression and produces a result using the normal rules of mathematics. As this command is expandable it can be used where  $\TeX$  requires a number and for example within a low-level `\edef` operation to give a purely numerical result. See `usrguide3` for further explanation.

`\inteval` The expandable command `\inteval` takes as its argument an integer expression and produces a result using the normal rules of mathematics. The operations recognised are `+`, `-`, `*` and `/` plus parentheses. Division occurs with *rounding*, and ties are rounded away from zero. As this command is expandable it can be used where  $\TeX$  requires a number and for example within a low-level `\edef` operation to give a purely numerical result. See `usrguide3` for further explanation. `\dimeval` and `\skipeval` are similar, but generate fixed and rubber length values, respectively.

`\fpeval` A document level wrapper around the code level function for floating point calculations.  
`\inteval`  
`\dimeval`  
`\skipeval`

```

155 \<*2ekernel | latexrelease>
156 \<latexrelease>\IncludeInRelease{2022/06/01}%
157 \<latexrelease>\let \fpeval \fp_and_int_calculations}%
158 \ExplSyntaxOn
159 \cs_new_eq:NN \fpeval \fp_eval:n

```

And a few more, this time wrappers around the  $\epsilon\TeX$  primitives.

```

160 \cs_new_eq:NN \inteval \int_eval:n

```

```

161 \cs_new_eq:NN \dimeval \dim_eval:n
162 \cs_new_eq:NN \skipeval \skip_eval:n
163 \ExplSyntaxOff

```

(End definition for `\fpeval` and others.)

```

164 </2ekernel | latexrelease>
165 <latexrelease>\EndIncludeInRelease
166 <latexrelease>\IncludeInRelease{0000/00/00}%
167 <latexrelease>          {\fpeval}{fp and int calculations}%
168 <latexrelease>
169 <latexrelease>\let\fpeval\@undefined
170 <latexrelease>\let\interval\@undefined
171 <latexrelease>\let\dimeval\@undefined
172 <latexrelease>\let\skipeval\@undefined
173 <latexrelease>\EndIncludeInRelease

```

**\UseName** When declaring new commands with `\NewDocumentCommand` or `\NewCommandCopy`  
**\ExpandArgs** or similar, it is sometimes necessary to “construct” the csname. As a general mechanism the L3 programming layer has `\exp_args:N...` for this, but there is no mechanism for it if `\ExplSyntaxOn` is not active. We therefore offer a few of these commands also with CamelCase names.

**\UseName** A document wrapper for changing arguments to cs names for use with `\NewDocumentCommand`  
**\ExpandArgs** and similar functions.

```

174 <*2ekernel | latexrelease>
175 <latexrelease>\IncludeInRelease{2022/06/01}%
176 <latexrelease>          {\ExpandArgs}{Some pre-expansion commands}%
177 \ExplSyntaxOn
178 \cs_new_eq:NN \UseName \use:c
179 \cs_new:Npn \ExpandArgs #1
180 {
181   \cs_if_exist_use:cF { exp_args:N #1 }
182   { \msg_expandable_error:nnn { kernel } { unknown-arg-expansion } {#1} }
183 }
184 \msg_new:nnn { kernel } { unknown-arg-expansion }
185 { Unknown-arg-expansion-“#1” }
186 \ExplSyntaxOff

```

(End definition for `\UseName` and `\ExpandArgs`.)

```

187 </2ekernel | latexrelease>
188 <latexrelease>\EndIncludeInRelease
189 <latexrelease>\IncludeInRelease{0000/00/00}%
190 <latexrelease>          {\ExpandArgs}{Some pre-expansion commands}%
191 <latexrelease>
192 <latexrelease>\let\UseName\@undefined
193 <latexrelease>\let\ExpandArgs\@undefined
194 <latexrelease>\EndIncludeInRelease

```

# File f

## ltdefns.dtx

### 1 Definitions

This section contains commands used in defining other macros.

```
1 <*2ekernel>
```

#### 1.1 Initex initializations

`\two@digits` Prefix a number less than 10 with ‘0’.

```
2 \def\two@digits#1{\ifnum#1<10 0\fi\number#1}
```

*(End definition for \two@digits.)*

`\typeout` Display something on the terminal.

```
3 </2ekernel>
4 <*2ekernel | latexrelease>
5 <latexrelease> \IncludeInRelease{2020/10/01}%
6 <latexrelease> { \typeout}{Allow "par" in \typeout}%
7 \protected\long\def\typeout#1{\begingroup
8   \set@display@protect
9   \def\par{^^J^^J}%
10  \immediate\write\@unused{#1}\endgroup}
11 </2ekernel | latexrelease>
12 <latexrelease> \EndIncludeInRelease
13 <latexrelease> \IncludeInRelease{0000/00/00}%
14 <latexrelease> { \typeout}{Allow "par" in \typeout}%
15 <latexrelease>
16 <latexrelease> \def\typeout#1{\begingroup\set@display@protect
17 <latexrelease> \immediate\write\@unused{#1}\endgroup}
18 <latexrelease> \EndIncludeInRelease
19 <*2ekernel>
```

*(End definition for \typeout.)*

`\newlinechar` A char to be used as new-line in output to files.

```
20 \newlinechar‘^^J
```

*(End definition for \newlinechar.)*

#### 1.2 Saved versions of TeX primitives

The TeX primitive `\foo` is saved as `\@@foo`. The following primitives are handled in this way:

`\@@par`

```
21 \let\@@par=\par
22 %\let\@@input=\input      %%% moved earlier
23 %\let\@@end=\end          %%%
```

*(End definition for \@@par.)*

`\@@hyph` Save original primitive definition.

```

24 \let\@@hyph=\-

```

(End definition for `\@@hyph`.)

`\@@italiccorr` Save the original italic correction.

```

25 \let\@@italiccorr=\/

```

(End definition for `\@@italiccorr`.)

`\@height` The following definitions save token space. E.g., using `\@height` instead of `height` saves 5 tokens at the cost in time of one macro expansion.

```

\@depth
\@width
\@minus
\@plus
26 \def\@height{height} \def\@depth{depth} \def\@width{width}
27 \def\@minus{minus}
28 \def\@plus{plus}

```

The next one is another 100 tokens worth.

```

29 \def\hb@xt@{\hbox to}

```

(End definition for `\@height` and others.)

```

30 \message{hacks,}

```

`\hb@xt@`

### 1.3 Command definitions

This section defines the following commands:

`\@namedef` `{\NAME}`  
Expands to `\def{\NAME}`, except name can contain any characters.

`\@nameuse` `{\NAME}`  
Expands to `\{\NAME\}`.

`\@ifnextchar` `X{\YES}{\NO}`  
Expands to `\YES` if next character is an ‘X’, and to `\NO` otherwise. (Uses `\reserved@a–\reserved@c`.) NOTE: GOBBLES ANY SPACE FOLLOWING IT.

`\@ifstar` `{\YES}{\NO}`  
Gobbles following spaces and then tests if next the character is a ‘\*’. If it is, then it gobbles the ‘\*’ and expands to `\YES`, otherwise it expands to `\NO`.

`\@dblarg` `{\CMD}{\ARG}`  
Expands to `\{\CMD\}[\ARG]{\ARG}`. Use `\@dblarg\CS` when `\CS` takes arguments `[ARG1]{ARG2}`, where default is `ARG1 = ARG2`.

`\@ifundefined` `{\NAME}{\YES}{\NO}`  
: If `\NAME` is undefined then it executes `\YES`, otherwise it executes `\NO`. More precisely, true if `\NAME` either undefined or = `\relax`.

`\@ifdefinable` `\NAME{\YES}` Executes `\YES` if the user is allowed to define `\NAME`, otherwise it gives an error. The user can define `\NAME` if `\@ifundefined{\NAME}` is true, ‘`\NAME`’ ≠ ‘`\relax`’ and the first three letters of ‘`\NAME`’ are not ‘`\end`’, and if `\endNAME` is not defined.

`\newcommand` `*{\F00}[\i]{\TEXT}`  
User command to define `\F00` to be a macro with `i` arguments (`i = 0` if missing) having the definition `\TEXT`. Produces an error if `\F00` already defined.

Normally the command is defined to be `\long` (ie it may take multiple paragraphs in its argument). In the star-form, the command is not defined as `\long` and a blank line in any argument to the command would generate an error.

`\renewcommand` `*{\F00}[\i]{\TEXT}`

Same as `\newcommand`, except it checks if `\F00` already defined.

`\newenvironment`       $\star\{\langle FOO\rangle\}[\langle i\rangle]\{\langle DEF1\rangle\}\{\langle DEF2\rangle\}$   
equivalent to:  
`\newcommand{\F00}[i]{DEF1} \def{\endF00}{DEF2}`  
(or the appropriate star forms).

`\renewenvironment`      Obvious companion to `\newenvironment`.

`\@cons`                  : See description of `\output` routine.

`\@car`                  `\@car T1 T2 ... Tn\@nil == T1` (unexpanded)

`\@cdr`                  `\@cdr T1 T2 ... Tn\@nil == T2 ... Tn` (unexpanded)

`\typeout`                 $\{\langle message\rangle\}$   
Produces a warning message on the terminal.

`\typein`                 $\{\langle message\rangle\}$   
Types message, asks the user to type in a command, then executes it

`\typein`                 $[\langle\backslash CS\rangle]\{\langle MSG\rangle\}$   
Same as above, except defines `\CS` to be the input instead of executing it.

`\typein`

```

31 \def\typein{%
32   \let\@typein\relax
33   \@testopt\@xtypein\@typein}

34 \ifx\directlua\@undefined

35 \def\@xtypein[#1]#2{%
36   \typeout{#2}%
37   \advance\endlinechar\@M
38   \read\@inputcheck to#1%
39   \advance\endlinechar-\@M
40   \@typein}%

41 \else

42 \def\@xtypein[#1]#2{%
43   \typeout{#2}%
44   \begingroup \endlinechar\m@ne
45   \read\@inputcheck to#1%
46   \expandafter\endgroup
47   \expandafter\def\expandafter#1\expandafter{#1}%
48   \@typein}%

49 \fi

(End definition for \typein.)

```

`\@namedef`

```

50 \def\@namedef#1{\expandafter\def\csname #1\endcsname}

(End definition for \@namedef.)

```

`\@nameuse`

```

51 \def\@nameuse#1{\csname #1\endcsname}

(End definition for \@nameuse.)

```



```

\@cons
52 \def\@cons#1#2{\begingroup\let\@elt\relax\xdef#1{#1\@elt #2}\endgroup}

(End definition for \@cons.)

\@car
\@cdr
53 \def\@car#1#2\@nil{#1}
54 \def\@cdr#1#2\@nil{#2}

(End definition for \@car and \@cdr.)

\@carcube \@carcube T1 ... Tn\@nil = T1 T2 T3 , n > 3
55 \</2ekernel>
56 \<latexrelease>\IncludeInRelease{2020/10/01}{\@carcube}{Make \@carcube long}%
57 \<*2ekernel | latexrelease>
58 \long\def\@carcube#1#2#3#4\@nil{#1#2#3}
59 \</2ekernel | latexrelease>
60 \<latexrelease>\EndIncludeInRelease
61 %
62 \<latexrelease>\IncludeInRelease{0000/00/00}{\@carcube}{Undo: Make \@carcube long}%
63 \<latexrelease>\def\@carcube#1#2#3#4\@nil{#1#2#3}
64 \<latexrelease>\EndIncludeInRelease
65 \<*2ekernel>

(End definition for \@carcube.)

\@onlypreamble This macro adds its argument to the list of commands stored in \@preamblecmds
\@preamblecmds to be disabled after \begin{document}. These commands are redefined to generate
\@notprerr at this point.
66 \def\@preamblecmds{}
67 \def\@onlypreamble#1{%
68   \expandafter\gdef\expandafter\@preamblecmds\expandafter{%
69     \@preamblecmds\do#1}}
70 \@onlypreamble\@onlypreamble
71 \@onlypreamble\@preamblecmds

(End definition for \@onlypreamble and \@preamblecmds.)

\@star@or@long Look ahead for a *. If present reset \l@ngrel@x so that the next definition, #1, will be
non-long.
72 \def\@star@or@long#1{%
73   \ifstar
74     {\let\l@ngrel@x\relax#1}%
75     {\let\l@ngrel@x\long#1}}

(End definition for \@star@or@long.)

\l@ngrel@x This is either \relax or \long depending on whether the *-form of a definition command
is being executed.
76 \let\l@ngrel@x\relax

(End definition for \l@ngrel@x.)

\newcommand User level \newcommand.
77 \def\newcommand{\@star@or@long\new@command}

```

```

\newcommand 78 \def\newcommand#1{%
79 \testopt{\@newcommand#1}0}

(End definition for \newcommand and \@newcommand.)

```

```

\@newcommand Handling arguments for \newcommand.
\@argdef 80 \def\@newcommand#1[#2]{%
\@xargdef 81 \kernel@ifnextchar [{\@xargdef#1[#2]}%
82 {\@argdef#1[#2]}}

```

Define #1 if it is definable.

Both here and in \@xargdef the replacement text is absorbed as an argument because if we are not allowed to make the definition we have to get rid of it completely.

```

83 \long\def\@argdef#1[#2]#3{%
84 \ifdefinable #1{\@yargdef#1\@ne{#2}{#3}}

```

Handle the second optional argument.

```

85 \long\def\@xargdef#1[#2] [#3]#4{%
86 \ifdefinable#1{%

```

Define the actual command to be:

```

\def\foo{\@protected@testopt\foo\\foo{default}}

```

where \\foo is a csname generated from applying \csname and \string to \foo, ie the actual name contains a backslash and therefore can't clash easily with existing command names. "Default" is the contents of the second optional argument of (re)newcommand.

```

87 \expandafter\def\expandafter#1\expandafter{%
88 \expandafter
89 \@protected@testopt
90 \expandafter
91 #1%
92 \csname\string#1\endcsname
93 {#3}}%

```

Now we define the internal macro ie \\foo which is supposed to pick up all arguments (optional and mandatory).

```

94 \expandafter\@yargdef
95 \csname\string#1\endcsname
96 \tw@
97 {#2}%
98 {#4}}

```

(End definition for \@newcommand, \@argdef, and \@xargdef.)

**\@testopt** This macro encapsulates the most common call to \@ifnextchar, saving several tokens each time it is used in the definition of a command with an optional argument. #1 The code to execute in the case that there is a [ need not be a single token but can be any sequence of commands that 'expects' to be followed by [. If this command were only used in \newcommand definitions then #1 would be a single token and the braces could be omitted from {#1} in the definition below, saving a bit of memory.

```

99 \long\def\@testopt#1#2{%
100 \kernel@ifnextchar[{#1}{#1[{#2}]]}

```

(End definition for \@testopt.)

`\@protected@testopt` Robust version of `\@testopt`. The extra argument (`#1`) must be a single token. If protection is needed the call expands to `\protect` applied to this token, and the 2nd and 3rd arguments are discarded (by `\@x@protect`). Otherwise `\@testopt` is called on the 2nd and 3rd arguments.

This method of making commands robust avoids the need for using up two csnames per command, the price is the extra expansion time for the `\ifx` test.

```

101 \def\@protected@testopt#1{%
102   \ifx\protect\@typeset@protect
103     \expandafter\@testopt
104   \else
105     \@x@protect#1%
106   \fi}

```

(End definition for `\@protected@testopt`.)

`\@yargdef` These generate a primitive argument specification, from a L<sup>A</sup>T<sub>E</sub>X [*digit*] form; in fact `\@yargd@f` *digit* can be anything such that `\number <digit>` is single digit.

Reorganised slightly so that `\renewcommand{\reserved@a}[1]{foo}` works. I am not sure this is worth it, as a following `\newcommand` would over-write the definition of `\reserved@a`.

Recall that L<sup>A</sup>T<sub>E</sub>X 2.09 goes into an infinite loop with `\renewcommand[1]{\@tempa}{foo}` (DPC 6 October 93).

Reorganised again (DPC 1999). Rather than make a loop to construct the argument spec by counting, just extract the required argument spec by using a delimited argument (delimited by the digit). This is faster and uses less tokens. The coding is slightly odd to preserve the old interface (using `#2 = \tw@` as the flag to surround the first argument with []). But the new method did not allow for the number of arguments `#3` not being given as an explicit digit; hence (further expansion of this argument and use of) `\number` was added later in 1999.

It is not clear why these are still `\long`.

```

107 \long \def \@yargdef #1#2#3{%
108   \ifx#2\tw@
109     \def\reserved@b##1{####1}%
110   \else
111     \let\reserved@b\@gobble
112   \fi
113   \expandafter
114     \@yargd@f \expandafter{\number #3}#1%
115 }

116 \long \def \@yargd@f#1#2{%
117   \def \reserved@a ##1#1#2##{%
118     \expandafter\def\expandafter#2\reserved@b ##1#1%
119   }%
120   \l@ngrel@x \reserved@a 0##1##2##3##4##5##6##7##8##9###1%
121 }

```

(End definition for `\@yargdef` and `\@yargd@f`.)

`\@reargdef`

```

122 \long\def\@reargdef#1[#2]{%
123   \@yargdef#1\@ne{#2}}

```

(End definition for \@reargdef.)

**\renewcommand** Check the command name is already used. If not give an error message. Then temporarily disable \@ifdefinable then call \newcommand. (Previous version \let#1=\relax but this does not work too well if #1 is \@tempa-e.)

```
124 \def\renewcommand{\@star@or@long\renew@command}
```

```
\renew@command 125 \def\renew@command#1{%
126   \begingroup \escapechar\m@ne\xdef\@gtempa{\string#1}}\endgroup
127   \expandafter\ifundefined\@gtempa
128     {\@latex@error{Command \string#1 undefined}\@ehc}%
129     \relax
130   \let\@ifdefinable\@rc@ifdefinable
131   \new@command#1}
```

(End definition for \renewcommand and \renew@command.)

**\@ifdefinable** Test if user is allowed to define a command.

```
\@ifdefinable 132 \long\def\@ifdefinable #1#2{%
\@rc@ifdefinable 133   \edef\reserved@a{\expandafter\@gobble\string #1}%
134   \@ifundefined\reserved@a
135     {\edef\reserved@b{\expandafter\@carcube \reserved@a xxx\@nil}}%
136     \ifx \reserved@b\@qend \@notdefinable\else
137       \ifx \reserved@a\@qrelax \@notdefinable\else
138         #2%
139       \fi
140     \fi}%
141   \@notdefinable}
```

Saved definition of \@ifdefinable.

```
142 \let\@@ifdefinable\@ifdefinable
```

Version of \@ifdefinable for use with \renewcommand. Does not do the check this time, but restores the normal definition.

```
143 \long\def\@rc@ifdefinable#1#2{%
144   \let\@ifdefinable\@@ifdefinable
145   #2}
```

(End definition for \@ifdefinable, \@@ifdefinable, and \@rc@ifdefinable.)

**\newenvironment** Define a new user environment. #1 is the environment name. #2# Grabs all the tokens up to the first {. These will be any optional arguments. They are not parsed at this point, but are just passed to \@newenv which will eventually call \newcommand. Any optional arguments will then be parsed by \newcommand as it defines the command that executes the 'begin code' of the environment.

This #2# trick removed with version 1.2i as it fails if a { occurs in the optional argument. Now use \@ifnextchar directly.

```
146 \def\newenvironment{\@star@or@long\new@environment}
```

```
\new@environment 147 \def\new@environment#1{%
148   \@testopt{\@newenva#1}0}
```

```

149 \def\@newenva#1[#2]{%
\@newenva 150   \kernel@ifnextchar [{\@newenvb#1[#2]}{\@newenv{#1}{[#2]}}}]

151 \def\@newenvb#1[#2][#3]{\@newenv{#1}{[#2][#3]}}
\@newenvb (End definition for \newenvironment and others.)

\renewenvironment Redefine an environment. For \renewenvironment disable \@ifdefinable and then call
\newenvironment. It is OK to \let the argument to \relax here as there should not
be a @temp... environment.
152 \def\renewenvironment{\@star@or@long\renew@environment}

\renew@environment 153 \def\renew@environment#1{%
154   \@ifundefined{#1}%
155     {\@latex@error{Environment #1 undefined}\@ehc
156     }\relax
157   \expandafter\let\csname#1\endcsname\relax
158   \expandafter\let\csname end#1\endcsname\relax
159   \new@environment{#1}}
(End definition for \renewenvironment and \renew@environment.)

\@newenv The internal version of \newenvironment.
Call \newcommand to define the <begin-code> for the environment. \def is used for
the <end-code> as it does not take arguments. (but may contain \pars)
Make sure that an attempt to define a ‘graf’ or ‘group’ environment fails.
160 \long\def\@newenv#1#2#3#4{%
161   \@ifundefined{#1}%
162     {\expandafter\let\csname#1\expandafter\endcsname
163       \csname end#1\endcsname}%
164     \relax
165   \expandafter\new@command
166     \csname #1\endcsname#2{#3}%
167     \l@ngrel@x\expandafter\def\csname end#1\endcsname{#4}}
(End definition for \@newenv.)

\newif And here’s a different sort of allocation: For example, \newif\iffoo creates \footrue,
\foofalse to go with \iffoo.
168 \def\newif#1{%
169   \count@\escapechar \escapechar\m@ne
170   \let#1\iffalse
171   \if#1\iftrue
172     \if#1\iffalse
173     \escapechar\count@}

\@if 174 \def\@if#1#2{%
175   \expandafter\def\csname\expandafter\@gobbletwo\string#1%
176     \expandafter\@gobbletwo\string#2\endcsname
177     {\let#1#2}}

```

(End definition for `\newif` and `\@if`.)

`\providecommand` `\providecommand` takes the same arguments as `\newcommand`, but discards them if #1 is already defined, Otherwise it just acts like `\newcommand`. This implementation currently leaves any discarded definition in `\reserved@a` (and possibly `\reserved@a`) this wastes a bit of space, but it will be reclaimed as soon as these scratch macros are redefined.

```
178 \def\providecommand{\@star@or@long\provide@command}
```

```
\provide@command 179 \def\provide@command#1{%
180   \begingroup
181     \escapechar\m@ne\xdef\@gtempa{\string#1}%
182   \endgroup
183   \expandafter\@ifundefined\@gtempa
184     {\def\reserved@a{\new@command#1}}%
185     {\def\reserved@a{\renew@command\reserved@a}}%
186   \reserved@a}%
(End definition for \providecommand and \provide@command.)
```

`\CheckCommand` `\CheckCommand` takes the same arguments as `\newcommand`. If the command already exists, with the same definition, then nothing happens, otherwise a warning is issued. Useful for checking the current state before a macro package starts redefining things. Currently two macros are considered to have the same definition if they are the same except for different default arguments. That is, if the old definition was: `\newcommand\xxx[2][a]{(#1)(#2)}` then `\CheckCommand\xxx[2][b]{(#1)(#2)}` would *not* generate a warning, but, for instance `\CheckCommand\xxx[2]{(#1)(#2)}` would.

```
187 \def\CheckCommand{\@star@or@long\check@command}
```

`\CheckCommand` is only available in the preamble part of the document.

```
188 \@onlypreamble\CheckCommand
```

```
\check@command 189 \def\check@command#1#2#{\@check@c#1{#2}}
190 \@onlypreamble\check@command
```

(End definition for `\CheckCommand` and `\check@command`.)

`\@check@c` `\CheckCommand` itself just grabs all the arguments we need, without actually looking for [ optional argument forms. Now define `\reserved@a`. If `\reserved@a` is then defined, compare it with the “#1’ otherwise compare `\reserved@a` with #1.

```
191 \long\def\@check@c#1#2#3{%
192   \expandafter\let\csname\string\reserved@a\endcsname\relax
193   \renew@command\reserved@a#2{#3}%
194   \@ifundefined{\string\reserved@a}%
195     {\@check@eq#1\reserved@a}%
196     {\expandafter\@check@eq
197       \csname\string#1\expandafter\endcsname
198       \csname\string\reserved@a\endcsname}}
199 \@onlypreamble\@check@c
```

(End definition for `\@check@c`.)

```

\@check@eq Complain if #1 and #2 are not \ifx equal.
200 \def\@check@eq#1#2{%
201   \ifx#1#2\else
202     \@latex@warning@no@line
203       {Command \noexpand#1 has
204         changed.\MessageBreak
205         Check if current package is valid}%
206   \fi}
207 \onlypreamble\@check@eq

(End definition for \@check@eq.)

\@gobble The \@gobble macro is used to get rid of its argument.
\@gobbletwo 208 \long\def \@gobble #1{}
\@gobblethree 209 \long\def \@gobbletwo #1#2{}
\@gobblefour 210 \long\def \@gobblethree #1#2#3{}
211 \long\def \@gobblefour #1#2#3#4{}

(End definition for \@gobble and others.)

\@firstofone Some argument-grabbers.
\@firstoftwo 212 \long\def \@firstofone#1{#1}
\@secondoftwo 213 \long\def \@firstoftwo#1#2{#1}
214 \long\def \@secondoftwo#1#2{#2}

\@iden is another name for \@firstofone for compatibility reasons.
215 \let\@iden\@firstofone

\@iden (End definition for \@firstofone and others.)

\@thirdofthree Another grabber now used in the encoding specific section.
216 \long\def \@thirdofthree#1#2#3{#3}

(End definition for \@thirdofthree.)

\@expandtwoargs A macro to totally expand two arguments to another macro
217 \def\@expandtwoargs#1#2#3{%
218   \edef\reserved@a{\noexpand#1{#2}{#3}}\reserved@a}

(End definition for \@expandtwoargs.)

\@backslashchar A category code 12 backslash.
219 \edef\@backslashchar{\expandafter\@gobble\string\\}

(End definition for \@backslashchar.)

```

## 1.4 Robust commands and protect

Fragile and robust commands are one of the thornier issues in L<sup>A</sup>T<sub>E</sub>X's commands. Whilst typesetting documents, L<sup>A</sup>T<sub>E</sub>X makes use of many of T<sub>E</sub>X's features, such as arithmetic, defining macros, and setting variables. However, there are (at least) three different occasions when these commands are not safe. These are called 'moving arguments' by L<sup>A</sup>T<sub>E</sub>X, and consist of:

- writing information to a file, such as indexes or tables of contents.
- writing information to the screen.
- inside an `\edef`, `\message`, `\mark`, or other command which evaluates its argument fully.

The method L<sup>A</sup>T<sub>E</sub>X uses for making fragile commands robust is to precede them with `\protect`. This can have one of four possible values:

- `\relax`, for normal typesetting. So `\protect\foo` will execute `\foo`.
- `\string`, for writing to the screen. So `\protect\foo` will write `\foo`.
- `\noexpand`, for writing to a file. So `\protect\foo` will write `\foo` followed by a space.
- `\@unexpandable@protect`, for writing a moving argument to a file. So `\protect\foo` will write `\protect\foo` followed by a space. This value is also used inside `\edefs`, `\marks` and other commands which evaluate their arguments fully. More precisely, whenever the content of an `\edef` or `\xdef` etc. can contain arbitrary user input not under the direct control of the programmer, one should use `\protected@edef` instead of `\edef`, etc., so that `\protect` has a suitable definition and the user input will not break if it contains fragile commands.

`\@unexpandable@protect`

```
220 \def\@unexpandable@protect{\noexpand\protect\noexpand}
```

*(End definition for \@unexpandable@protect.)*

`\DeclareRobustCommand`  
`\declare@robustcommand`

This is a package-writers command, which has the same syntax as `\newcommand`, but which declares a protected command. It does this by having

```
\DeclareRobustCommand\foo
define \foo to be \protect\foo<space>,
and then use \newcommand\foo<space>.
```

Since the internal command is `\foo<space>`, when it is written to an auxiliary file, it will appear as `\foo`.

We have to be a bit cleverer if we're defining a short command, such as `\_`, in order to make sure that the auxiliary file does not include a space after the command, since `\_ a` and `\_a` aren't the same. In this case we define `\_` to be:

```
\x@protect\_ \protect\_<space>
```

which expands to:



```

\ifx\protect\@typeset@protect\else
  \@x@protect@\_
\fi
\protect\_<space>

```

Then if `\protect` is `\@typeset@protect` (normally `\relax`) then we just perform `\_<space>`, and otherwise `\@x@protect@` gobbles everything up and expands to `\protect\_<space>`.

*Note:* setting `\protect` to any value other than `\relax` whilst in ‘typesetting’ mode will cause commands to go into an infinite loop! In particular, setting `\protect` to `\@empty` will cause `\_` to loop forever. It will also break lots of other things, such as protected `\ifmmodes` inside `\haligns`. If you really have to do such a thing, then please set `\@typeset@protect` to be `\@empty` as well. (This is what the code for `\patterns` does, for example.)

More fun with `\expandafter` and `\csname`.

```

221 \def\DeclareRobustCommand{\@star@or@long\declare@robustcommand}
222 \def\declare@robustcommand#1{%
223   \ifx#1\@undefined\else\ifx#1\relax\else
224     \@latex@info{Redefining \string#1}%
225   \fi\fi
226   \edef\reserved@a{\string#1}%
227   \def\reserved@b{#1}%
228   \edef\reserved@b{\expandafter\strip@prefix\meaning\reserved@b}%
229   \edef#1{%
230     \ifx\reserved@a\reserved@b
231       \noexpand\x@protect
232       \noexpand#1%
233     \fi
234     \noexpand\protect
235     \expandafter\noexpand\csname
236       \expandafter\@gobble\string#1 \endcsname
237   }%
238   \let\@ifdefinable\@rc@ifdefinable
239   \expandafter\new@command\csname
240     \expandafter\@gobble\string#1 \endcsname
241 }

```

(End definition for `\DeclareRobustCommand` and `\declare@robustcommand`.)

```

\@x@protect
\@x@protect
242 \def\x@protect#1{%
243   \ifx\protect\@typeset@protect\else
244     \@x@protect#1%
245   \fi
246 }
247 \def\@x@protect#1\fi#2#3{%
248   \fi\protect#1%
249 }

```

(End definition for `\@x@protect` and `\x@protect`.)

`\@typeset@protect` We set `\@typeset@protect` to `\relax` rather than `\@empty` to make sure that the protection mechanism stops the look-ahead and expansion performed at the start of `\halign` cells.

```

250 \let\@typeset@protect\relax

```

(End definition for \@typeset@protect.)

`\set@display@protect` These macros set `\protect` appropriately for typesetting or displaying.

`\set@typeset@protect` 251 `\def\set@display@protect{\let\protect\string}`  
 252 `\def\set@typeset@protect{\let\protect\@typeset@protect}`

(End definition for `\set@display@protect` and `\set@typeset@protect`.)

`\protected@edef` The commands `\protected@edef` and `\protected@xdef` perform ‘safe’ `\edefs` and

`\protected@xdef` `\xdefs`, saving and restoring `\protect` appropriately. For cases where restoring `\protect`

`\unrestored@protected@xdef` doesn’t matter, there’s an ‘unsafe’ `\unrestored@protected@xdef`, useful if you know  
`\restore@protect` what you’re doing!

253 `\def\protected@edef{%`  
 254 `\let\@@protect\protect`  
 255 `\let\protect\@unexpandable@protect`  
 256 `\afterassignment\restore@protect`  
 257 `\edef`  
 258 `}`  
 259 `\def\protected@xdef{%`  
 260 `\let\@@protect\protect`  
 261 `\let\protect\@unexpandable@protect`  
 262 `\afterassignment\restore@protect`  
 263 `\xdef`  
 264 `}`  
 265 `\def\unrestored@protected@xdef{%`  
 266 `\let\protect\@unexpandable@protect`  
 267 `\xdef`  
 268 `}`  
 269 `\def\restore@protect{\let\protect\@@protect}`

(End definition for `\protected@edef` and others.)

`\protect` The normal meaning of `\protect`

270 `\set@typeset@protect`

(End definition for `\protect`.)

`\MakeRobust` This macro makes an existing fragile macro robust, but only if it hasn’t been robust in the past, i.e., it checks for the existence of the macro `\<name>`<sub>␣</sub> and if that exists it assumes that `\<name>` is already robust. In that case either undefine the inner macro first or use `\DeclareRobustCommand` to define it in a robust way directly. We could probably test the top-level definition to have the right kind of structure, but this is somewhat problematical as we then have to distinguish between `\long` macros and others and also take into account that sometimes the top-level is deliberately done manually (like with `\begin`).

The macro firstly checks if the control sequence in question exists at all.

271 `\ifx\@makekernel\@empty`  
 272 `\ifx\@makekernel\@empty\@latexrelease\@includeinrelease{2020/10/01}{\MakeRobust}{\MakeRobust}%`  
 273 `\ifx\@makekernel\@empty\@latexrelease\@includeinrelease{2020/10/01}{\MakeRobust}{\MakeRobust}%`  
 274 `\def\MakeRobust#1{%`  
 275 `\count@=\escapechar`  
 276 `\escapechar=‘\’`  
 277 `\@ifundefined{expandafter\gobble\string#1}{%`  
 278 `\@latexerror{Command ‘\string#1’ undefined.}%`

```

279     \MessageBreak There is nothing here to make robust}}%
280     \@eha
281 }%

```

Then we check if the macro is already robust. We do this by testing if the internal name for a robust macro is defined, namely `\foo_`. If it is already defined do nothing, otherwise set `\foo_` equal to `\foo` and redefine `\foo` so that it acts like a macro defined with `\DeclareRobustCommand`. We use `\@kernel@rename@newcommand` to copy `\foo` over to `\foo_`, including a possible default optional argument.

```

282 {%
283   \ifundefined{\expandafter\@gobble\string#1\space}%
284   {%
285     \expandafter\@kernel@rename@newcommand
286     \csname\expandafter\@gobble\string#1\space\endcsname
287     #1%
288     \edef\reserved@a{\string#1}%
289     \def\reserved@b{#1}%
290     \edef\reserved@b{\expandafter\strip@prefix\meaning\reserved@b}%
291     \xdef#1{%
292       \ifx\reserved@a\reserved@b
293         \noexpand\x@protect\noexpand#1%
294       \fi
295       \noexpand\protect\expandafter\noexpand
296       \csname\expandafter\@gobble\string#1\space\endcsname}%
297   }%
298   {\@latex@info{Command ‘\string#1’ is already robust}}}%
299 }%
300 \escapechar=\count@
301 }%

```

`\@kernel@rename@newcommand` This macro renames a command, possibly with an optional argument (defined with `\newcommand`) from #2 to #1, by renaming the internal macro `\\#2` to `\\#1` and defining `\#1` appropriately, then undefining `\#2` and `\\#2`. The `\afterassignment` trick is to make both definitions in `\@copy@newcommand` global (which are local by default).

In case the macro was defined with `\newcommand` and an optional argument, to replicate exactly the behaviour of `\DeclareRobustCommand` we have to move also the internal `\\foo` to `\\foo_`. In that case, #1 will be a parameterless macro (`\robust@command@chk@safe` checks that), and `\@if@newcommand` will return true (both defined below in this file). If so, we can use `\@copy@newcommand` rather than plain `\let` to copy the command over. `\@kernel@rename@newcommand` does this test and carries out the renaming.

```

302 \def\@kernel@rename@newcommand#1#2{%
303   \robust@command@chk@safe#2%
304   {\@if@newcommand#2%
305     {\afterassignment\global
306       \global\@copy@newcommand#1#2%
307       \global\let#2\undefined
308       \global\expandafter\let\csname\string#2\endcsname\@undefined}%
309     {\global\let#1=#2}}}%
310   {\global\let#1=#2}}
311 \</2ekernel | latexrelease>
312 \<latexrelease>\EndIncludeInRelease

```

```

313 %
314 <latexrelease>\IncludeInRelease{2019/10/01}{\MakeRobust}{\MakeRobust}%
315 <latexrelease>\def\MakeRobust#1{%
316 <latexrelease>  \ifundefined{\expandafter\@gobble\string#1}{%
317 <latexrelease>    \@latex@error{The control sequence '\string#1' is undefined!%
318 <latexrelease>    \MessageBreak There is nothing here to make robust}%
319 <latexrelease>    \@eha
320 <latexrelease>  }%
321 <latexrelease>  {%
322 <latexrelease>    \ifundefined{\expandafter\@gobble\string#1\space}%
323 <latexrelease>    {%
324 <latexrelease>      \global\expandafter\let\csname
325 <latexrelease>        \expandafter\@gobble\string#1\space\endcsname=#1%
326 <latexrelease>      \edef\reserved@a{\string#1}%
327 <latexrelease>      \def\reserved@b{#1}%
328 <latexrelease>      \edef\reserved@b{\expandafter\strip@prefix\meaning\reserved@b}%
329 <latexrelease>      \xdef#1{%
330 <latexrelease>        \ifx\reserved@a\reserved@b
331 <latexrelease>          \noexpand\x@protect\noexpand#1%
332 <latexrelease>        \fi
333 <latexrelease>        \noexpand\protect\expandafter\noexpand
334 <latexrelease>        \csname\expandafter\@gobble\string#1\space\endcsname}%
335 <latexrelease>      }%
336 <latexrelease>    {\@latex@info{The control sequence '\string#1' is already robust}}%
337 <latexrelease>  }%
338 <latexrelease>}%
339 <latexrelease>\let\@kernel@rename@newcommand\@undefined
340 <latexrelease>\EndIncludeInRelease
341 %
342 <latexrelease>\IncludeInRelease{2015/01/01}{\MakeRobust}{\MakeRobust}%
343 <latexrelease>\def\MakeRobust#1{%
344 <latexrelease>  \ifundefined{\expandafter\@gobble\string#1}{%
345 <latexrelease>    \@latex@error{The control sequence '\string#1' is undefined!%
346 <latexrelease>    \MessageBreak There is nothing here to make robust}%
347 <latexrelease>    \@eha
348 <latexrelease>  }%
349 <latexrelease>  {%
350 <latexrelease>    \ifundefined{\expandafter\@gobble\string#1\space}%
351 <latexrelease>    {%
352 <latexrelease>      \expandafter\let\csname
353 <latexrelease>        \expandafter\@gobble\string#1\space\endcsname=#1%
354 <latexrelease>      \edef\reserved@a{\string#1}%
355 <latexrelease>      \def\reserved@b{#1}%
356 <latexrelease>      \edef\reserved@b{\expandafter\strip@prefix\meaning\reserved@b}%
357 <latexrelease>      \xdef#1{%
358 <latexrelease>        \ifx\reserved@a\reserved@b
359 <latexrelease>          \noexpand\x@protect\noexpand#1%
360 <latexrelease>        \fi
361 <latexrelease>        \noexpand\protect\expandafter\noexpand
362 <latexrelease>        \csname\expandafter\@gobble\string#1\space\endcsname}%
363 <latexrelease>      }%
364 <latexrelease>    {\@latex@info{The control sequence '\string#1' is already robust}}%
365 <latexrelease>  }%
366 <latexrelease>}%

```

```

367 <latexrelease>\let\@kernel@rename@newcommand\@undefined
368 <latexrelease>\EndIncludeInRelease
369 %
370 <latexrelease>\IncludeInRelease{0000/00/00}{\MakeRobust}{\MakeRobust}%
371 <latexrelease>\let\MakeRobust\@undefined
372 <latexrelease>\let\@kernel@rename@newcommand\@undefined
373 <latexrelease>\EndIncludeInRelease
374 <*2ekernel>

```

(End definition for \MakeRobust and \@kernel@rename@newcommand.)

**\kernel@make@fragile** The opposite of \MakeRobust except that it doesn't do many checks as it is internal to the kernel. Why does one want such a thing? Only for compatibility reasons if latexrelease requests a rollback of the kernel. For this reason we pretend that this command existed in all earlier versions of L<sup>A</sup>T<sub>E</sub>X i.e., we are not rolling it back since we need it precisely then. But we have to get it into the latexrelease file so that a roll forward is possible too.

```

375 </2ekernel>
376 <*2ekernel | latexrelease>
377 <latexrelease>\IncludeInRelease{2020/10/01}%
378 <latexrelease>          {\kernel@make@fragile}{Undo robustness}%
379 \def\kernel@make@fragile#1{%
380   \@ifundefined{\expandafter\@gobble\string#1\space}%

```

If not robust do nothing.

```

381   {}%

```

Otherwise copy \foo<sub>␣</sub> back to \foo. Then use \@kernel@rename@newcommand to check and copy \foo<sub>␣</sub> back to \foo in case the command has an optional argument. If so, also undefine \foo<sub>␣</sub>, and at the end undefine \foo<sub>␣</sub>.

```

382   {%
383     \global\expandafter\let\expandafter #1\csname
384       \expandafter\@gobble\string#1\space\endcsname
385     \expandafter\@kernel@rename@newcommand
386       \csname\expandafter\@gobble\string#1\expandafter\endcsname
387       \csname\expandafter\@gobble\string#1\space\endcsname
388     \global\expandafter\let\csname
389       \expandafter\@gobble\string#1\space\endcsname\@undefined
390   }%
391 }
392 <latexrelease>\EndIncludeInRelease
393 %
394 <latexrelease>\IncludeInRelease{0000/00/00}%
395 <latexrelease>          {\kernel@make@fragile}{Undo robustness}%
396 <latexrelease>\def\kernel@make@fragile#1{%
397 <latexrelease>  \@ifundefined{\expandafter\@gobble\string#1\space}%
398 <latexrelease>    {}%
399 <latexrelease>    {%
400 <latexrelease>      \global\expandafter\let\expandafter #1\csname
401 <latexrelease>        \expandafter\@gobble\string#1\space\endcsname
402 <latexrelease>      \global\expandafter\let\csname
403 <latexrelease>        \expandafter\@gobble\string#1\space\endcsname\@undefined
404 <latexrelease>    }%
405 <latexrelease>}

```

```

406 \latexrelease\EndIncludeInRelease
407 \if2ekernel\latexrelease
408 \*2ekernel

```

(End definition for \kernel@make@fragile.)

## 1.5 Acting on robust commands

```

409 \if2ekernel
410 \latexrelease\IncludeInRelease{2020-10-01}{\robust@command@act}
411 \latexrelease {Add \robust@command@act}%
412 \*2ekernel\latexrelease

```

With most document level commands being robust now there is more of a requirement to have a standard way of aliasing (or copying) a command to a new name, for example to save an original definition before changing a command. `\DeclareCommandCopy` is analogous to  $\text{\TeX}$ 's `\let`, except that it copes with the different types of robust commands defined by  $\text{\LaTeX}$ 's mechanisms.

A couple of “types of robustness” are defined by the  $\text{\LaTeX 2}_\epsilon$  kernel, namely robust commands defined with `\DeclareRobustCommand` and commands with optional arguments defined with `\newcommand`. However there are other types of robust commands that are frequently used, which are not defined in the  $\text{\LaTeX 2}_\epsilon$  kernel, like commands defined with `xparse`'s `\NewDocumentCommand` and `etoolbox`'s `\newrobustcmd`.

In this section we will define a generic extensible machinery to act on robust commands. This code will then be used to test if a command is robust, considered the different types of robustness, and then either copy that definition, if `\DeclareCommandCopy` (or similar) is used, or show the definition of the command, if `\ShowCommand` is used.

`\robust@command@act` The looping machinery is generic and knows nothing about what is to be done for each case. The syntax of the main macro `\robust@command@act` is:

```

\robust@command@act<action-list><robust-cmd>
<fallback-action><act-arg>

```

`<action-list>` is a token list of the form:

```

{\if-type-1} <act-type-1>
{\if-type-2} <act-type-2>
...

```

`\robust@command@act` will iterate over the `<action-list>`, evaluating each `<if-type-n>` `<robust-cmd>` `{\true}{\false}`. If the `<if-type-n>` conditional returns `<true>`, then `<act-type-n>``<act-arg>` is executed, and the loop ends. If the conditional returns `<false>`, then `<if-type-n + 1>` is executed in the same way, until either one of the conditionals return `<true>`, or the end of the `<action-list>` is reached. If the end is reached, then `<fallback-action>``<act-arg>` is executed before `\robust@command@act` exits.

`\robust@command@act` will start by using `\robust@command@act@chk@args` to check if the `<robust-cmd>` (#2) is a parameterless (possibly `\protected`) macro. If it is not, the command is not a robust command: these always start with a parameterless user-level macro; in that case, `\robust@command@act@end` is used to short-circuit the process and do the `<fallback-action>` (#3). This first test is necessary because later on we need to be able to expand the `<robust-cmd>` without the risk of it Breaking Badly, and as a bonus, this speeds up the process in case we used `\NewCommandCopy` in a “normal” macro.

```

413 \long\def\robust@command@act#1#2#3#4{%

```

```

414 \robust@command@chk@safe#2%
415   {\expandafter\robust@command@act@loop
416     \expandafter#2%
417     #1{\@nnil\@nnil}%
418     \robust@command@act@end}%
419   {\robust@command@act@end}%
420   {#3}{#4}}%

```

If `\robust@command@act@chk@args` branched to false, then `\robust@command@act@loop` will loop over the list of items in the  $\langle action-list \rangle$  ( $\#1$ ), and process each item as described earlier. If the  $\langle if-type-n \rangle$  command expands to  $\langle true \rangle$  then `\robust@command@act@do` is used to execute  $\langle act-type-n \rangle$  on the  $\langle act-arg \rangle$ , otherwise the loop resumes with the next item.

```

421 \long\def\robust@command@act@loop#1#2{\robust@command@act@loop@aux#1#2}
422 \long\def\robust@command@act@loop@aux#1#2#3{%
423   \ifx\@nnil#2%
424   \else
425     #2{#1}%
426     {\robust@command@act@do{#3}}%
427     {\expandafter\robust@command@act@loop\expandafter#1}%
428   \fi}
429 \long\def\robust@command@act@do#1%
430   \fi#2%
431   \robust@command@act@end#3#4{%
432   \fi
433   #1#4}

```

If the end is reached and no action was taken, then do  $\langle fallback-action \rangle \langle act-arg \rangle$ .

```

\robust@command@act@end 434 \long\def\robust@command@act@end#1#2{#1#2}

```

```

\robust@command@chk@safe 435 \long\def\robust@command@chk@safe#1{%
\robust@command@act@chk@args 436   \begingroup
437   \escapechar='\\
438   \expandafter\endgroup\expandafter
439   \robust@command@act@chk@args\meaning#1:->\@nil}
440 \def\robust@command@act@chk@args#1:->#2\@nil{%
441   \@expl@str@if@eq@nnTF{#1}{macro}%
442   {\@firstoftwo}%
443   {\@expl@str@if@eq@nnTF{#1}{\protected macro}%
444   {\@firstoftwo}%
445   {\@secondoftwo}}}

446 </2ekernel | latexrelease>
447 <latexrelease>\EndIncludeInRelease
448 <latexrelease>\IncludeInRelease{0000-00-00}{\robust@command@act}
449 <latexrelease> {Add \robust@command@act}%
450 <latexrelease>\let\robust@command@act\@undefined
451 <latexrelease>\let\robust@command@act@loop\@undefined
452 <latexrelease>\let\robust@command@act@loop@aux\@undefined
453 <latexrelease>\let\robust@command@act@do\@undefined
454 <latexrelease>\let\robust@command@act@end\@undefined
455 <latexrelease>\let\robust@command@chk@safe\@undefined
456 <latexrelease>\let\robust@command@act@chk@args\@undefined

```

```

457 <latexrelease>\EndIncludeInRelease
458 <*2ekernel>
(End definition for \robust@command@act and others.)

```

### 1.5.1 Copying robust commands

```

459 </2ekernel>
460 <latexrelease>\IncludeInRelease{2020-10-01}{\DeclareCommandCopy}
461 <latexrelease> {Add \NewCommandCopy, \RenewCommandCopy, and \DeclareCommandCopy}%
462 <*2ekernel | latexrelease>

```

`\NewCommandCopy` `\NewCommandCopy` starts by checking if `#1` is already defined, and raises an error if so, otherwise the definition is carried out. `\RenewCommandCopy` does (almost) the opposite. `\DeclareCommandCopy` If the command is *not* defined, then an error is raised. But the definition is carried out anyway, so the behaviour is consistent with `\renewcommand`.

A `\ProvideCommandCopy` isn't defined because it's not reasonably useful. `\provide...` commands mean "define this if there's no other definition", but copying a command (usually) implies that the command being copied is defined, so `\ProvideCommandCopy` doesn't make a lot of sense. But more importantly, the most common use case of copying a command is to redefine it later, while preserving the old definition, as in:

```

\ProvideCommandCopy \A \B
\renewcommand \B { ... \A ... }

```

then, if `\A` is already defined the first line is skipped, and in this case `\B` won't work as expected.

The three versions call the internal `\declare@commandcopy` with the proper action. `\@firstofone` will carry out the copy. The only case when the copy is not made is the `<false>` case for `\NewCommandCopy`, in which the command already exists and the definition is aborted.

```

463 \def\NewCommandCopy{%
464   \declare@commandcopy
465   {\@firstofone}%
466   {\@firstoftwo\@notdefinable}}
467 \def\RenewCommandCopy{%
468   \declare@commandcopy
469   {\@latexerror{Command \backslashchar\reserved@a\space undefined}\@ehc
470   \@firstofone}%
471   {\@firstofone}}
472 \def\DeclareCommandCopy{%
473   \declare@commandcopy
474   {\@firstofone}%
475   {\@firstofone}}

```

Start by checking if the command is already defined. The proper action is taken by each specific command above. If all's good, then `\robust@command@act` is called with the proper arguments as described earlier, with `\@declarecommandcopylisthook` as the *<action-list>* and `\declare@commandcopy@let` as the *<fallback-action>*.

`\declare@commandcopy`

```

476 \long\def\declare@commandcopy#1#2#3#4{%
477   \edef\reserved@a{\expl@cs@to@str@{N#3}}%
478   \@ifundefined\reserved@a{#1}{#2}%
479   {\robust@command@act
480    \@declarecommandcopylisthook#4%
481    \declare@commandcopy@let{#3#4}}}

```



The initial definition of `\@declarecommandcopylisthook` contains the tests for the two types of robust command in the kernel.

```

482 \def\@declarecommandcopylisthook{%
\@declarecommandcopylisthook 483   {\@if@DeclareRobustCommand \@copy@DeclareRobustCommand}%
484   {\@if@newcommand \@copy@newcommand}}

```

The initial definition of `\@declarecommandcopylisthook` contains the tests for the two types of robust command in the kernel.

```

485 \long\def\declare@commandcopy@let#1#2{\let#1=#2\relax}
\declare@commandcopy@let

```

Now the rollback code.

```

486 </2ekernel | latexrelease>
487 <latexrelease>\EndIncludeInRelease
488 <latexrelease>\IncludeInRelease{0000-00-00}{\DeclareCommandCopy}
489 <latexrelease> {Undefine \NewCommandCopy, \RenewCommandCopy, and \DeclareCommandCopy}%
490 <latexrelease>\let\NewCommandCopy\@undefined
491 <latexrelease>\let\RenewCommandCopy\@undefined
492 <latexrelease>\let\DeclareCommandCopy\@undefined
493 <latexrelease>\let\declare@commandcopy\@undefined
494 <latexrelease>\let\@declarecommandcopylisthook\@undefined
495 <latexrelease>\let\declare@commandcopy@let\@undefined
496 <latexrelease>\EndIncludeInRelease
497 <*2ekernel>

```

*(End definition for \NewCommandCopy and others.)*

## 1.5.2 Showing robust commands

`\ShowCommand` Most of the machinery defined for `\NewCommandCopy` can be used to show the definition of a robust command, in a similar fashion to `\texdef`. The difference is that after the command's is detected to has a given type of robustness, rather than making a copy, we use a separate routine to show its definition.

With all the machinery in place, `\ShowCommand` itself is quite simple: use `\robust@command@act` to iterate through the `\@showcommandlisthook` list, and if nothing is found, fallback to `\show`.

```

498 </2ekernel>
499 <latexrelease>\IncludeInRelease{2020-10-01}{\ShowCommand}%
500 <latexrelease> {Add \ShowCommand}%
501 <*2ekernel | latexrelease>
502 \long\def\ShowCommand#1{%
503   \robust@command@act
504   \@showcommandlisthook#1%
505   \show#1}

```

`\@showcommandlisthook` The initial definition of `\@showcommandlisthook` contains the same tests as used for copying, but `\@show@...` commands instead of `\@copy@...`. Same as before, it is initialized to cope with `\DeclareRobustCommand` and `\newcommand` with optional arguments.

```

506 \def\@showcommandlisthook{%
507   {\@if@DeclareRobustCommand \@show@DeclareRobustCommand}%
508   {\@if@newcommand \@show@newcommand}}

```

Now the rollback code.

```

509 </2ekernel | latexrelease>
510 <latexrelease>\EndIncludeInRelease
511 <latexrelease>\IncludeInRelease{0000-00-00}{\ShowCommand}
512 <latexrelease> {Undefine \ShowCommand}%
513 <latexrelease>\let\ShowCommand\@undefined
514 <latexrelease>\let\@showcommandlisthook\@undefined
515 <latexrelease>\EndIncludeInRelease
516 <*2ekernel>

(End definition for \ShowCommand and \@showcommandlisthook.)

517 </2ekernel>
518 <latexrelease>\IncludeInRelease{2020-10-01}{\@if@DeclareRobustCommand}
519 <latexrelease> {Add \@if@DeclareRobustCommand, \@if@newcommand,
520 <latexrelease> \@copy@DeclareRobustCommand, \@copy@newcommand,
521 <latexrelease> \@show@DeclareRobustCommand, \@show@newcommand}%
522 <*2ekernel | latexrelease>

```

### 1.5.3 Commands defined with \DeclareRobustCommand

`\@if@DeclareRobustCommand` Now that we provided a generic way to copy one macro to another, we need to define a way to check if a command is one of L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>'s robust types. These tests are heavily based on Heiko's `\LetLtxMacro`, but chopped into separate macros.

`\@if@DeclareRobustCommand` checks if a command `\cmd` was defined by `\DeclareRobustCommand`. The test returns true if the expansion of `\cmd` is exactly `\protect\cmd␣`.

```

523 \long\def\@if@DeclareRobustCommand#1{%
524   \begingroup
525     \escapechar='\\
526     \edef\reserved@a{\string#1}%
527     \edef\reserved@b{\detokenize{#1}}%
528     \xdef\@gtempa{%
529       \ifx\reserved@a\reserved@b
530         \noexpand\x@protect
531         \noexpand#1%
532       \fi
533       \noexpand\protect
534       \expandafter\noexpand\csname\@expl@cs@to@str@N#1 \endcsname}%
535   \endgroup
536   \ifx\@gtempa#1\relax
537     \expandafter\@firstoftwo
538   \else
539     \expandafter\@secondoftwo
540   \fi}

```

If a command was defined by `\DeclareRobustCommand` (that is, `\@if@DeclareRobustCommand` returns true), then to make a copy of `\cmd` into `\foo` we define the latter such that it expands to `\protect\foo␣`, then make `\foo␣` equal to `\cmd␣`.

There is one detail we need to take care of: if a command was defined with `\DeclareRobustCommand` it may still have an optional argument, in which case there is one more macro layer before the actual definition of the command. We use `\@if@newcommand` to check that and `\@copy@newcommand` to do the copying.

```

541 \long\def\@copy@DeclareRobustCommand#1#2{%

```

```

542 \begingroup
543   \escapechar='\\
544   \edef\reserved@a{\string#1}%
545   \edef\reserved@b{\detokenize{#1}}%
546   \edef\reserved@a{%
547 \endgroup
548 \def\noexpand#1{%
549   \ifx\reserved@a\reserved@b
550     \noexpand\x@protect
551     \noexpand#1%
552   \fi
553   \noexpand\protect
554   \expandafter\noexpand\csname\@expl@cs@to@str@N#1 \endcsname}%
555 \noexpand\copy@kernel@robust@command
556   \expandafter\noexpand\csname\@expl@cs@to@str@N#1 \endcsname
557   \expandafter\noexpand\csname\@expl@cs@to@str@N#2 \endcsname}%
558 \reserved@a}
559 \long\def\copy@kernel@robust@command#1#2{%
560   \robust@command@chk@safe#2%
561   {\@if@newcommand#2%
562     {\@copy@newcommand}%
563     {\declare@commandcopy@let}}
564   {\declare@commandcopy@let}%
565   #1#2}

```

Showing the command is pretty simple. This command prints the top-level expansion as  $\TeX$ 's `\show` would, but with `robust macro:` rather than just `macro:`, then a blank line and then `\show` the inner command. For a macro defined with, say, `\DeclareRobustCommand\foo[1]{bar}`, it will print:

```

> \foo=robust macro:
->\protect \foo .

> \foo =\long macro:
#1->bar.

```

If the inner command is defined with an optional argument, then `\@show@newcommand` is also used.

The value of `\escapechar` is deliberately not enforced, so `\ShowCommand` behaves more like `\show`.

```

566 \long\def\@show@DeclareRobustCommand#1{%
567   \typeout{> \string#1=robust macro:}%
568   \typeout{->\@expl@cs@replacement@spec@N#1.^~J}%
569   \expandafter\show@kernel@robust@command
570   \csname\@expl@cs@to@str@N#1 \endcsname}
571 \long\def\show@kernel@robust@command#1{%
572   \robust@command@chk@safe#1%
573   {\@if@newcommand#1%
574     {\@show@newcommand}%
575     {\show}}}%
576   {\show}%
577   #1}

```

*(End definition for \@if@DeclareRobustCommand and others.)*

### 1.5.4 Commands defined with \newcommand (with optional argument)

`\@if@newcommand` A command `\cmd` (or `\cmdL`, if it was defined with `\DeclareRobustCommand`) with an optional argument will expand to `\@protected@testopt\cmd\cmd{<opt>}`. To check that we look at the first three tokens in the expansion of `\cmd`, and return true or false accordingly.

This test *requires* that the command be a parameterless macro, otherwise it will not work (and probably break). This is ensured with `\robust@command@chk@safe` before calling `\@if@newcommand`.

```

578 \long\def\@if@newcommand#1{%
579   \edef\reserved@a{%
580     \noexpand\@protected@testopt
581     \noexpand#1%
582     \expandafter\noexpand\csname\@backslashchar\@expl@cs@to@str@@N#1\endcsname}%
583   \edef\reserved@b{%
584     \unexpanded\expandafter\expandafter\expandafter
585     {\expandafter\@carcube#1{}{}{}\@nil}}%
586   \ifx\reserved@a\reserved@b
587     \expandafter\@firstoftwo
588   \else
589     \expandafter\@secondoftwo
590   \fi}

```

Then, if a command `\cmd` takes an optional argument, we copy it to `\foo` by defining the latter to expand to `\@protected@testopt\foo\foo{<opt>}`.

`\@copy@newcommand`

```

591 \long\def\@copy@newcommand#1#2{%
592   \edef#1{\noexpand\@protected@testopt
593     \noexpand#1%
594     \expandafter\noexpand\csname\@backslashchar\@expl@cs@to@str@@N#1\endcsname
595     \unexpanded\expandafter\expandafter\expandafter
596     {\expandafter\@gobblethree#2}}%
597   \expandafter
598   \let\csname\@backslashchar\@expl@cs@to@str@@N#1\expandafter\endcsname
599   \csname\@backslashchar\@expl@cs@to@str@@N#2\endcsname}

```

A command being `\shown` here is guaranteed to have an optional argument. Start by showing the top-level expansion of the command (using `\typeout` to avoid TeX asking for interaction and extra context lines), then call `\@show@newcommand@aux` with the internal command, which contains the actual definition, and with the expansion of the command to extract the default value of the optional argument.

`\@show@newcommand`  
`\@show@newcommand@aux`

```

600 \long\def\@show@newcommand#1{%
601   \typeout{> \string#1=robust macro:}%
602   \typeout{->\@expl@cs@replacement@spec@@N#1.^^J}%
603   \expandafter\@show@newcommand@aux
604   \csname\@backslashchar\@expl@cs@to@str@@N#1\expandafter\endcsname
605   \expandafter{#1}}

```

For a macro defined with, say, `\newcommand\foo[1][opt]{bar}`, it will print:

```

> \foo=robust macro:
->\@protected@testopt \foo \foo {opt}.

> \foo=\long macro:

```

```
> default #1=opt.
[#1]->bar.
```

If the command was defined with `\DeclareRobustCommand`, then another pair of lines show the top-level expansion `\protect_\foo_\_`.

The extra gymnastics with `\showtokens` ensures that `\showtokens` itself, and the internals of this macro aren't showed in the context lines.

```
606 \long\def\@show@newcommand@aux#1#2{%
607   \typeout{> \string#1=\@expl@cs@prefix@spec@N#1macro:}%
608   \edef\reserved@a{%
609     default \string##1=\expandafter\detokenize\@gobblethree#2.^~J%
610     \@expl@cs@argument@spec@N#1->\@expl@cs@replacement@spec@N#1}%
611   \showtokens\expandafter\expandafter\expandafter{\expandafter\reserved@a}}
```

Now the rollback code.

```
612 </2ekernel | latexrelease>
613 <latexrelease>\EndIncludeInRelease
614 <latexrelease>\IncludeInRelease{0000-00-00}{\@if@DeclareRobustCommand}
615 <latexrelease> {Undefine \@if@DeclareRobustCommand, \@if@newcommand,
616 <latexrelease>          \@copy@DeclareRobustCommand, \@copy@newcommand,
617 <latexrelease>          \@show@DeclareRobustCommand, \@show@newcommand}%
618 <latexrelease>\let\@if@DeclareRobustCommand\@undefined
619 <latexrelease>\let\@copy@DeclareRobustCommand\@undefined
620 <latexrelease>\let\@show@DeclareRobustCommand\@undefined
621 <latexrelease>\let\@if@newcommand\@undefined
622 <latexrelease>\let\@copy@newcommand\@undefined
623 <latexrelease>\let\@show@newcommand\@undefined
624 %
625 <latexrelease>\let\copy@kernel@robust@command\@undefined
626 <latexrelease>\let\show@kernel@robust@command\@undefined
627 <latexrelease>\let\@show@newcommand@aux\@undefined
628 <latexrelease>\EndIncludeInRelease
629 <*2ekernel>
```

*(End definition for \@if@newcommand and others.)*

## 1.6 Internal defining commands

These commands are used internally to define other L<sup>A</sup>T<sub>E</sub>X commands.

`\@ifundefined` Check if first arg is undefined or `\relax` and execute second or third arg depending,

```
630 </2ekernel>
631 <latexrelease>\IncludeInRelease{2018-04-01}{\@ifundefined}
632 <latexrelease>\Leave commands undefined in \@ifundefined}%
633 <*2ekernel | latexrelease>
```

Version using `\ifcsname` to avoid defining undefined tokens to `\relax`. Defined here to simplify using unmatched `\fi`.

```
634 \def\@ifundefined#1{%
635   \ifcsname#1\endcsname\@ifundefin@d@i\else\@ifundefin@d@ii\fi{#1}}
636 \long\def\@ifundefin@d@i#1\fi#2{\fi
637   \expandafter\ifx\csname #2\endcsname\relax
638     \@ifundefin@d@ii
639     \fi
640     \@secondoftwo}
```

```
641 \long\def\@ifundefin@d@ii\fi#1#2#3{\fi #2}
```

Now test of engine.

```
642 \ifx\numexpr\@undefined
```

Classic version (should not be needed as etex is assumed).

```
643 \def\@ifundefined#1{%
644   \expandafter\ifx\csname#1\endcsname\relax
645     \expandafter\@firstoftwo
646   \else
647     \expandafter\@secondoftwo
648   \fi}
649 \else\ifx\directlua\@undefined
```

Use the \ifcsname defined above.

```
650 \else
```

Optimised version for Lua<sub>TeX</sub>, using \lastnamedcs

```
651 \def\@ifundefined#1{%
652   \ifcsname#1\endcsname
653     \expandafter\ifx\lastnamedcs\relax\else\@ifundefin@d@i\fi
654   \fi
655   \@firstoftwo}

656 \long\def\@ifundefin@d@i#1#2#3#4#5{#1#2#5}

657 \fi
658 \fi
659 </2ekernel | latexrelease>
660 <latexrelease>\EndIncludeInRelease
661 <latexrelease>\IncludeInRelease{0000-00-00}{\@ifundefined}
662 <latexrelease>\{Leave commands undefined in \@ifundefined}%
663 <latexrelease>\def\@ifundefined#1{%
664   <latexrelease> \expandafter\ifx\csname#1\endcsname\relax
665   <latexrelease> \expandafter\@firstoftwo
666   <latexrelease> \else
667   <latexrelease> \expandafter\@secondoftwo
668   <latexrelease> \fi}
669 <latexrelease>\EndIncludeInRelease
670 <*2ekernel>
```

*(End definition for \@ifundefined.)*

`\@qend`    The following define `\@qend` and `\@qrelax` to be the strings ‘end’ and ‘relax’ with the characters `\catcoded 12`.

```
671 \edef\@qend{\expandafter\@cdr\string\end\@nil}
672 \edef\@qrelax{\expandafter\@cdr\string\relax\@nil}
```

*(End definition for \@qend and \@qrelax.)*

`\@ifnextchar`    `\@ifnextchar` peeks at the following character and compares it with its first argument. If both are the same it executes its second argument, otherwise its third.

```
673 \long\def\@ifnextchar#1#2#3{%
674   \let\reserved@d=#1%
675   \def\reserved@a{#2}%
676   \def\reserved@b{#3}%
677   \futurelet\@let@token\@ifnch}
```

(End definition for \@ifnextchar.)

**\kernel@ifnextchar** This macro is the kernel version of \@ifnextchar which is used in a couple of places to prevent the AMS variant from being used since in some places this produced chaos (for example if an `fd` file is loaded in a random place then the optional argument to `\ProvidesFile` could get printed there instead of being written only in the log file. This happened when there was a space or a newline between the mandatory and optional arguments! It should really be fixed in the `amsmath` package one day, but...

Note that there may be other places in the kernel where this version should be used rather than the original, but variable, version.

```
678 \let\kernel@ifnextchar\@ifnextchar
```

(End definition for \kernel@ifnextchar.)

**\@ifnch** \@ifnch is a tricky macro to skip any space tokens that may appear before the character in question. If it encounters a space token, it calls xifnch.

```
679 \def\@ifnch{%
680   \ifx\@let@token\@sptoken
681     \let\reserved@c\@xifnch
682   \else
683     \ifx\@let@token\reserved@d
684       \let\reserved@c\reserved@a
685     \else
686       \let\reserved@c\reserved@b
687     \fi
688   \fi
689   \reserved@c}
```

(End definition for \@ifnch.)

**\@sptoken** The following code makes \@sptoken a space token. It is important here that the control sequence `\:` consists of a non-letter only, so that the following whitespace is significant. Together with the fact that the equal sign in a `\let` may be followed by only one optional space the desired effect is achieved. NOTE: the following hacking must precede the definition of `\:` as math medium space.

```
690 \def\:{\let\@sptoken= } \: % this makes \@sptoken a space token
```

(End definition for \@sptoken.)

**\@xifnch** In the following definition of \@xifnch, `\:` is again used to get a space token as delimiter into the definition.

```
691 \def\:{\@xifnch} \expandafter\def\:{\futurelet\@let@token\@ifnch}
```

(End definition for \@xifnch.)

**\@ifstar** The new implementation below avoids passing the *<true code>* Through one more `\def` than the *<false code>*, which previously meant that `#` had to be written as `####` in one argument, but `##` in the other. The `*` is gobbled by \@firstoftwo.

```
692 \def\@ifstar#1{\@ifnextchar *{\@firstoftwo{#1}}}
```

(End definition for \@ifstar.)

```

\@dblarg
\@xdblarg 693 \long\def\@dblarg#1{\kernel@ifnextchar[{#1}{\@xdblarg{#1}}}{
694 \long\def\@xdblarg#1#2{#1[{#2}]{#2}}

```

(End definition for \@dblarg and \@xdblarg.)

**\@sanitize** The command \@sanitize changes the catcode of all special characters except for braces to ‘other’. It can be used for commands like \index that want to write their arguments verbatim. Needless to say, this command should only be executed within a group, or chaos will ensue.

```

695 \def\@sanitize{\@makeother\ \@makeother\\\@makeother\$\@makeother\&%
696 \@makeother\#\@makeother\^\@makeother\_ \@makeother\%\@makeother\~}

```

(End definition for \@sanitize.)

**\@onelevel@sanitize** This makes the whole “meaning” of #1 (its one-level expansion) into catcode 12 tokens: it could be used in \DeclareRobustCommand.

If it is to be used on default float specifiers, this should be done when they are defined.

```

697 \def \@onelevel@sanitize #1{%
698   \edef #1{\expandafter\strip@prefix
699             \meaning #1}%
700 }

```

(End definition for \@onelevel@sanitize.)

**\string@makeletter** Iterates through a string, turning each alphabetic character into a catcode-11 token (partly undoes a \detokenize). Useful for \ifx-based string comparisons where \detokenize-ing the other string would break too much code.

The macro uses expl3’s \@expl@str@map@function@NN to iterate on the string (without losing spaces) and applies \string@makeletter on each character. The latter checks if character is between a–z or A–Z, and uses \@alph or \@Alph to get the corresponding catcode-11 token. Other tokens are passed through unchanged.

```

701 </2ekernel>
702 <latexrelease>\IncludeInRelease{2020/10/01}{\string@makeletter}
703 <latexrelease> {Add \string@makeletter}%
704 <*2ekernel | latexrelease>
705 \def\string@makeletter#1{%
706   \@expl@str@map@function@NN#1\@string@makeletter}
707 \def\@string@makeletter#1{%
708   \@char@if@alph{#1}%
709   {\@expl@char@generate@nn{‘#1’}{11}}%
710   {#1}}
711 \def\@char@if@alph#1{%
712   \ifnum0\ifnum‘#1<‘A 1\fi\ifnum‘#1>‘z 1\fi
713   \if\ifnum‘#1>‘Z @\fi\ifnum‘#1<‘a @\fi01\fi>0
714   \expandafter\@secondoftwo
715   \else
716     \expandafter\@firstoftwo
717   \fi}
718 </2ekernel | latexrelease>
719 <latexrelease>\EndIncludeInRelease
720 %

```



```

721 <latexrelease>\IncludeInRelease{0000/00/00}{\string@makeletter}
722 <latexrelease> {Undefine \string@makeletter}%
723 <latexrelease>\let\string@makeletter\@undefined
724 <latexrelease>\let\@string@makeletter\@undefined
725 <latexrelease>\let\char@if@alph\@undefined
726 <latexrelease>\EndIncludeInRelease
727 <*2ekernel>

```

(End definition for \string@makeletter, \@string@makeletter, and \char@if@alph.)

`\makeatletter` Make internal control sequences accessible or inaccessible.

```

\makeatother 728 \DeclareRobustCommand\makeatletter{\catcode'\@11\relax}
729 \DeclareRobustCommand\makeatother{\catcode'\@12\relax}

```

(End definition for \makeatletter and \makeatother.)

## 2 Discretionary Hyphenation

`\-`  
`\@dischyp`

Moved here to be after the definition of `\DeclareRobustCommand`.

The primitive `\-` command adds a discretionary hyphen using the current font's `\hyphenchar`. Monospace fonts are usually declared with `\hyphenchar` set to `-1` to suppress hyphenation.

L<sup>A</sup>T<sub>E</sub>X, from L<sup>A</sup>T<sub>E</sub>X 2.09 in 1986 defined `\-` by

```
\def\-\{\discretionary{-}{-}{-}
```

The following comment was added when these commands were first set up, 19 April 1986:

the `\-` command is redefined to allow it to work in the `\ttfamily` type style, where automatic hyphenation is suppressed by setting `\hyphenchar` to `-1`. The original primitive T<sub>E</sub>X definition is saved as `\@@hyph` just in case anyone needs it.

L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>, between 1993 and 2017, had a comment at this point saying that the definition “would probably change” because the definition always uses `-`. The definition used below was given in comments at this point during time.

In 2017 we finally enabled this definition by default, with the older L<sup>A</sup>T<sub>E</sub>X definition accessible via `latexrelease` as usual.

In LuaL<sup>A</sup>T<sub>E</sub>X the primitive definition of `\-` is used directly because it's use of extended hyphenation parameters means that `\-` works correctly even with `\hyphenchar` set to `-1`. This change makes `\-` under LuaL<sup>A</sup>T<sub>E</sub>X compatible with language specific hyphenation characters.

Temporary definition of `\@latex@info`, final definition is later.

```

730 \def\@latex@info#1{}
731 </2ekernel>
732 <latexrelease>\IncludeInRelease{2020/10/01}{\-\}{Use primitive \- in Lua\LaTeX}%
733 <*2ekernel | latexrelease>
734 \ifx\directlua\@undefined
735   \DeclareRobustCommand{\-\}{%
736     \discretionary{%
737       \char \ifnum\hyphenchar\font<\z@

```

```

738         \defaultthyphenchar
739     \else
740         \hyphenchar\font
741     \fi
742     }{}{}%
743 }
744 \else
745     \let\-\@@hyph
746 \fi
747 </2ekernel | latexrelease>
748 <latexrelease>\EndIncludeInRelease
749 <latexrelease>\IncludeInRelease{2017/04/15}{\-\}{Use \hyphenchar in \-}%
750 <latexrelease>\DeclareRobustCommand{\-}{}%
751 <latexrelease> \discretionary{%
752 <latexrelease>     \char \ifnum\hyphenchar\font<\z@
753 <latexrelease>         \defaultthyphenchar
754 <latexrelease>     \else
755 <latexrelease>         \hyphenchar\font
756 <latexrelease>     \fi
757 <latexrelease>         }{}{}%
758 <latexrelease>}
759 <latexrelease>\EndIncludeInRelease
760 <latexrelease>\IncludeInRelease{0000/00/00}{\-\}{Use \hyphenchar in \-}%
761 <latexrelease>\def\-\{\discretionary{\-}{}{}}
762 <latexrelease>\EndIncludeInRelease

763 <*2ekernel | latexrelease>
764 \let\@dischyph=\-
765 </2ekernel | latexrelease>
766 <*2ekernel>

(End definition for \- and \@dischyph.)
    Delayed from ltvers.dtx

767 \newif\if@includeinrelease
768 \@includeinreleasefalse

    Delayed from ltplain.dtx

769 </2ekernel>
770 <*2ekernel | latexrelease>
771 <latexrelease>\IncludeInRelease{2019/10/01}%
772 <latexrelease>         {\allowbreak}{Make various commands robust}%
773 \MakeRobust\allowbreak
774 \MakeRobust\bigbreak
775 \MakeRobust\break
776 \MakeRobust\dotfill
777 \MakeRobust\frenchspacing
778 \MakeRobust\goodbreak
779 \MakeRobust\hrulefill
780 \MakeRobust\medbreak
781 \MakeRobust\nobreak
782 \MakeRobust\nonfrenchspacing
783 \MakeRobust\obeylines
784 \MakeRobust\obeyspaces
785 \MakeRobust\slash
786 \MakeRobust\smallbreak

```

```

787 \MakeRobust\strut
788 \MakeRobust\underbar
789 </2ekernel | latexrelease>
790 <latexrelease>\EndIncludeInRelease
791 <latexrelease>\IncludeInRelease{0000/00/00}%
792 <latexrelease>                {\allowbreak}{Make various commands robust}%
793 <latexrelease>
794 <latexrelease>\kernel@make@fragile\allowbreak
795 <latexrelease>\kernel@make@fragile\bigbreak
796 <latexrelease>\kernel@make@fragile\break
797 <latexrelease>\kernel@make@fragile\dotfill
798 <latexrelease>\kernel@make@fragile\frenchspacing
799 <latexrelease>\kernel@make@fragile\goodbreak
800 <latexrelease>\kernel@make@fragile\hrulefill
801 <latexrelease>\kernel@make@fragile\medbreak
802 <latexrelease>\kernel@make@fragile\nobreak
803 <latexrelease>\kernel@make@fragile\nonfrenchspacing
804 <latexrelease>\kernel@make@fragile\obeylines
805 <latexrelease>\kernel@make@fragile\obeyspaces
806 <latexrelease>\kernel@make@fragile\slash
807 <latexrelease>\kernel@make@fragile\smallbreak
808 <latexrelease>\kernel@make@fragile\strut
809 <latexrelease>\kernel@make@fragile\underbar
810 <latexrelease>
811 <latexrelease>\EndIncludeInRelease
812 <*2ekernel>

```

`\g@addto@macro` Globally add to the end of a macro. This macro is used by the kernel to add to its internal hooks.

```

813 \long\def\g@addto@macro#1#2{%
814   \begingroup
815     \toks@\expandafter{#1#2}%
816     \xdef#1{\the\toks@}%
817   \endgroup}

```

*(End definition for \g@addto@macro.)*

```

818 </2ekernel>

```

# File g

## ltxcmd.dtx

### 1 Creating document commands

Document commands should be created using the tools provided by this module: `\NewDocumentCommand`, etc., in almost all cases. This allows clean separation of document-level syntax from code-level interfaces. Users have a need to create new document commands, and as such a significant amount of documentation for `ltxcmd` is provided as part of `usrguide3`. Here, additional material aimed at programmers is provided

```

1 <@@=cmd>
2 <*2ekernel>
3 \message{document commands,}
4 </2ekernel>

```

`ltxcmd` code contains an `^^@` character, which usually has catcode 15, so `\IncludeInRelease` will break when this code is being skipped, so we'll save the catcode of `^^@` to restore later:

```

5 <*2ekernel | latexrelease>
6 <latexrelease>\edef\@latexrelease@catcode@null{\the\catcode'\^^@ }
7 <latexrelease>\catcode'\^^@=12
8 \ExplSyntaxOn
9 <latexrelease>\NewModuleRelease{2020/10/01}{ltxcmd}
10 <latexrelease>{Document~command~parser}%

```

#### 1.1 Variables and constants

---

`\l__cmd_arg_spec_tl` Holds the argument specification after normalization of shorthands.

```

11 \tl_new:N \l__cmd_arg_spec_tl

```

---

`\l__cmd_args_tl` Token list variable for grabbed arguments.

```

12 \tl_new:N \l__cmd_args_tl

```

---

`\l__cmd_args_i_tl` Hold the modified arguments when dealing with default values or processors.

`\l__cmd_args_ii_tl`

```

13 \tl_new:N \l__cmd_args_i_tl

```

```

14 \tl_new:N \l__cmd_args_ii_tl

```

---

`\l__cmd_current_arg_int` The number of the current argument being set up: this is used to make sure there are at most 9 arguments, then for creating the expandable auxiliary functions and knowing how many arguments the code function should take.

```

15 \int_new:N \l__cmd_current_arg_int

```

<u>\l__cmd_defaults_bool</u> <u>\l__cmd_defaults_tl</u>	<p>The boolean indicates whether there are any argument with default value other than -NoValue-; the token list holds the code to determine these default values in terms of other arguments.</p> <pre> 16 \bool_new:N \l__cmd_defaults_bool 17 \tl_new:N \l__cmd_defaults_tl </pre>
<u>\l__cmd_environment_bool</u>	<p>Generating environments uses the same mechanism as generating functions. However, full processing of arguments is always needed for environments, and so the function-generating code needs to know this. This variable is also used at run time to give correct error messages.</p> <pre> 18 \bool_new:N \l__cmd_environment_bool </pre>
<u>\l__cmd_environment_str</u>	<p>Name of the environment, used at definition time and at run time.</p> <pre> 19 \str_new:N \l__cmd_environment_str </pre>
<u>\l__cmd_expandable_bool</u>	<p>Used to indicate if an expandable command is begin generated, as this affects both the acceptable argument types and how they are implemented.</p> <pre> 20 \bool_new:N \l__cmd_expandable_bool </pre>
<u>\l__cmd_expandable_aux_name_tl</u>	<p>Used to create pretty-printing names for the auxiliaries: although the immediate definition does not vary, the full expansion does and so it does not count as a constant.</p> <pre> 21 \tl_new:N \l__cmd_expandable_aux_name_tl 22 \tl_set:Nn \l__cmd_expandable_aux_name_tl 23   { 24     \l__cmd_function_tl \c_space_tl 25     ( arg~ \int_use:N \l__cmd_current_arg_int ) 26   } </pre>
<u>\g__cmd_grabber_int</u>	<p>Used (in exceptional cases) to get unique names for grabbers used by expandable commands.</p> <pre> 27 \int_new:N \g__cmd_grabber_int </pre>
<u>\l__cmd_fn_tl</u>	<p>For passing the pre-formed name of the auxiliary to be used as the parsing function.</p> <pre> 28 \tl_new:N \l__cmd_fn_tl </pre>
<u>\l__cmd_fn_code_tl</u>	<p>For passing the pre-formed name of the auxiliary that contains the actual code.</p> <pre> 29 \tl_new:N \l__cmd_fn_code_tl </pre>

<u>\l__cmd_function_tl</u>	<p>Holds the control sequence name of the function currently being defined: used to avoid passing this as an argument and to avoid repeated use of <code>\cs_to_str:N</code>.</p> <pre>30 \tl_new:N \l__cmd_function_tl</pre>
<u>\l__cmd_grab_expandably_bool</u>	<p>When defining a non-expandable command, indicates whether the arguments can all safely be grabbed by expandable grabbers. This is to support abuses of <code>xparse</code> that use protected functions inside <code>csname</code> constructions.</p> <pre>31 \bool_new:N \l__cmd_grab_expandably_bool</pre>
<u>\l__cmd_obey_spaces_bool</u>	<p>For trailing optionals.</p> <pre>32 \bool_new:N \l__cmd_obey_spaces_bool</pre>
<u>\l__cmd_last_delimiters_tl</u>	<p>Holds the delimiters (first tokens) of all optional arguments since the previous mandatory argument, to warn about cases where it would be impossible to omit optional arguments completely because the following mandatory argument has the same delimiter as one of the optional arguments.</p> <pre>33 \tl_new:N \l__cmd_last_delimiters_tl</pre>
<u>\l__cmd_long_bool</u>	<p>Used to indicate that an argument is long, on a per-argument basis.</p> <pre>34 \bool_new:N \l__cmd_long_bool</pre>
<u>\l__cmd_m_args_int</u>	<p>The number of <code>m</code> arguments: if this is the same as the total number of arguments, then a short-cut can be taken in the creation of the grabber code.</p> <pre>35 \int_new:N \l__cmd_m_args_int</pre>
<u>\l__cmd_prefixed_bool</u>	<p>When preparing the signature of non-expandable commands, indicates that the current argument is affected by a processor or by <code>+</code> (namely is long).</p> <pre>36 \bool_new:N \l__cmd_prefixed_bool</pre>
<u>\l__cmd_process_all_tl</u> <u>\l__cmd_process_one_tl</u> <u>\l__cmd_process_some_bool</u>	<p>When preparing the signature, the processors that will be applied to a given argument are collected in <code>\l__cmd_process_one_tl</code>, while <code>\l__cmd_process_all_tl</code> contains processors for all arguments. The boolean indicates whether there are any processors (to bypass the whole endeavour otherwise).</p> <pre>37 \tl_new:N \l__cmd_process_all_tl 38 \tl_new:N \l__cmd_process_one_tl 39 \bool_new:N \l__cmd_process_some_bool</pre>

---

`\l__cmd_saved_args_tl` Stores `\l__cmd_args_tl` to deal with space-trimming of b-type arguments.

---

```
40 \tl_new:N \l__cmd_saved_args_tl
```

---

`\l__cmd_signature_tl` Used when constructing the signature (code for argument grabbing) to hold what will become the implementation of the main function. When arguments are grabbed (at point of use of the command/environment), it also stores the code for grabbing the remaining arguments.

---

```
41 \tl_new:N \l__cmd_signature_tl
```

---

`\l__cmd_some_obey_spaces_bool`  
`\l__cmd_some_long_bool`  
`\l__cmd_some_short_bool`

---

These flags are set while normalizing the argument specification. The `obey_spaces` one is used to detect when `!` is used on an argument that is not a trailing optional argument. The other two are used to check whether all short arguments appear before long arguments: this is needed to grab arguments expandably. As soon as the first long argument is seen (other than t-type, whose long status is ignored) the `some_long` flag is set. The `some_short` flag is used for expandable commands, to know whether to define a short auxiliary too.

```
42 \bool_new:N \l__cmd_some_obey_spaces_bool
43 \bool_new:N \l__cmd_some_long_bool
44 \bool_new:N \l__cmd_some_short_bool
```

---

`\l__cmd_tmp_prop`  
`\l__cmd_tmpa_tl`  
`\l__cmd_tmptb_tl`

---

Scratch space.

```
45 \prop_new:N \l__cmd_tmp_prop
46 \tl_new:N \l__cmd_tmptb_tl
47 \tl_new:N \l__cmd_tmptb_tl
48 \cs_new_eq:NN \__cmd_tmp:w ?
```

(End definition for `\__cmd_tmp:w`.)

With `xparse`, information about commands being (re)defined was switched off by default, unless the `log-declarations` package option was used, so here we'll switch that off as well.

```
49 \msg_redirect_module:nnn { cmd } { info } { none }
```

Also add `cmd` to the LaTeX messages.

```
50 \prop_gput:Nnn \g_msg_module_type_prop { cmd } { LaTeX }
```

## 1.2 Declaring commands and environments

`\__cmd_declare_cmd:Nnn` The main functions for creating commands set the appropriate flag then use the same internal code to do the definition.

```
\__cmd_declare_expandable_cmd:Nnn
\__cmd_declare_cmd_aux:Nnn
\__cmd_declare_cmd_internal:Nnn
51 \cs_new_protected:Npn \__cmd_declare_cmd:Nnn
52 {
53   \bool_set_false:N \l__cmd_expandable_bool
```

```

54   \__cmd_declare_cmd_aux:Nnn
55 }
56 \cs_new_protected:Npn \__cmd_declare_expandable_cmd:Nnn
57 {
58   \bool_set_true:N \l__cmd_expandable_bool
59   \__cmd_declare_cmd_aux:Nnn
60 }

```

The first stage is to log information, both for the user in the log and for programmatic use in a property list of all declared commands.

```

61 \cs_new_protected:Npn \__cmd_declare_cmd_aux:Nnn #1#2#3
62 {
63   \cs_if_exist:NTF #1
64   {
65     \msg_info:nxxx { cmd } { redefine }
66     { \token_to_str:N #1 } { \tl_to_str:n {#2} }
67   }
68   {
69     \bool_lazy_or:nnT
70     { \cs_if_exist_p:c { \cs_to_str:N #1 ~ code } }
71     { \cs_if_exist_p:c { \cs_to_str:N #1 ~ defaults } }
72     {
73       \msg_warning:nxx { cmd } { unsupported-let }
74       { \token_to_str:N #1 }
75     }
76     \msg_info:nxxx { cmd } { define-command }
77     { \token_to_str:N #1 } { \tl_to_str:n {#2} }
78   }
79   \bool_set_false:N \l__cmd_environment_bool
80   \__cmd_declare_cmd_internal:Nnnn #1 {#2} {#3} { }
81 }

```

At definition time, the variable `\l__cmd_fn_tl` is only used for error messages. The real business of defining a document command starts with setting up the appropriate name, then normalizing the argument specification to get rid of shorthands.

```

82 \cs_new_protected:Npn \__cmd_declare_cmd_internal:Nnnn #1#2#3#4
83 {
84   \tl_set:Nx \l__cmd_function_tl { \cs_to_str:N #1 }
85   \tl_set:Nx \l__cmd_fn_tl
86   { \exp_not:c { \l__cmd_function_tl \c_space_tl } }
87   \__cmd_normalize_arg_spec:n {#2}
88   \exp_args:No \__cmd_prepare_signature:n \l__cmd_arg_spec_tl
89   \__cmd_declare_cmd_code:Nnn #1 {#2} {#3}
90   #4
91   \__cmd_break_point:n {#2}
92 }

```

*(End definition for `\__cmd_declare_cmd:Nnn` and others.)*

`\__cmd_break_point:n` A marker used to escape from creating a definition if necessary.

```

93 \cs_new_eq:NN \__cmd_break_point:n \use_none:n

```

*(End definition for `\__cmd_break_point:n`.)*



```

\__cmd_declare_cmd_code:Nnn
  \__cmd_declare_cmd_code_aux:Nnn
\__cmd_declare_cmd_code_expandable:Nnn

```

The appropriate auxiliary is called.

```

94 \cs_new_protected:Npn \__cmd_declare_cmd_code:Nnn
95 {
96   \bool_if:NTF \l__cmd_grab_expandably_bool
97   { \__cmd_declare_cmd_code_expandable:Nnn }
98   { \__cmd_declare_cmd_code_aux:Nnn }
99 }

```

Standard functions call `\__cmd_start:nNNnnn`, which receives the argument specification, an auxiliary used for grabbing arguments, an auxiliary containing the code, and then the signature, default arguments, and processors.

```

100 \cs_new_protected:Npn \__cmd_declare_cmd_code_aux:Nnn #1#2#3
101 {
102   \cs_generate_from_arg_count:cNnn
103   { \l__cmd_function_tl \c_space_tl code }
104   \cs_set_protected:Npn \l__cmd_current_arg_int {#3}
105   \cs_set_protected_nopar:Npx #1
106   {
107     \bool_if:NTF \l__cmd_environment_bool
108     {
109       \__cmd_start_env:nnnnn { \exp_not:n {#2} }
110       { \l__cmd_environment_str }
111     }
112     {
113       \__cmd_start:nNNnnn { \exp_not:n {#2} }
114       \exp_not:c { \l__cmd_function_tl \c_space_tl }
115       \exp_not:c { \l__cmd_function_tl \c_space_tl code }
116     }
117     { \exp_not:o \l__cmd_signature_tl }
118     {
119       \bool_if:NT \l__cmd_defaults_bool
120       { \exp_not:o \l__cmd_defaults_tl }
121     }
122     {
123       \bool_if:NT \l__cmd_process_some_bool
124       { \exp_not:o \l__cmd_process_all_tl }
125     }
126   }
127 }

```

Expandable functions and functions whose arguments can be grabbed expandably call `\__cmd_start_expandable:nNNNNn`, which receives the argument specification, four auxiliaries (two for grabbing arguments, one for the code, and one for default arguments), and finally the signature. Non-expandable functions that take this branch should nevertheless be protected, as well as their `code` function. They will only be expanded in contexts such as constructing a `csname`. The two grabbers (named after the function with one or two spaces) are needed when there are both short and long arguments; otherwise the same grabber is included twice in the definition. If all arguments are long or all are short the (only) grabber is defined correspondingly to be long/short. Otherwise two grabbers are defined, one long, one short.

```

128 \cs_new_protected:Npn \__cmd_declare_cmd_code_expandable:Nnn #1#2#3
129 {
130   \exp_args:Ncc \cs_generate_from_arg_count:NNnn
131   { \l__cmd_function_tl \c_space_tl code }

```

```

132 { cs_set \bool_if:NF \l__cmd_expandable_bool { _protected } :Npn }
133 \l__cmd_current_arg_int {#3}
134 \bool_if:NT \l__cmd_defaults_bool
135 {
136   \use:x
137   {
138     \cs_generate_from_arg_count:cNnn
139     { \l__cmd_function_tl \c_space_tl defaults }
140     \cs_set:Npn \l__cmd_current_arg_int
141     { \exp_not:o \l__cmd_defaults_tl }
142   }
143 }
144 \bool_if:NTF \l__cmd_expandable_bool
145 { \cs_set_nopar:Npx } { \cs_set_protected_nopar:Npx } #1
146 {
147   \exp_not:N \__cmd_start_expandable:nNNNNn
148   { \exp_not:n {#2} }
149   \exp_not:c { \l__cmd_function_tl \c_space_tl }
150   \exp_not:c
151   {
152     \l__cmd_function_tl \c_space_tl
153     \bool_if:NT \l__cmd_some_short_bool
154     { \bool_if:NT \l__cmd_some_long_bool { \c_space_tl } }
155   }
156   \exp_not:c { \l__cmd_function_tl \c_space_tl code }
157   \bool_if:NTF \l__cmd_defaults_bool
158   { \exp_not:c { \l__cmd_function_tl \c_space_tl defaults } }
159   { ? }
160   { \exp_not:o \l__cmd_signature_tl }
161 }
162 \bool_if:NTF \l__cmd_some_long_bool
163 {
164   \bool_if:NT \l__cmd_some_short_bool
165   {
166     \cs_set_nopar:cpx { \l__cmd_function_tl \c_space_tl \c_space_tl }
167     ##1##2 { ##1 {##2} }
168   }
169   \cs_set:cpx
170 }
171 { \cs_set_nopar:cpx }
172 { \l__cmd_function_tl \c_space_tl } ##1##2 { ##1 {##2} }
173 }

```

(End definition for \\_\_cmd\_declare\_cmd\_code:Nnn, \\_\_cmd\_declare\_cmd\_code\_aux:Nnn, and \\_\_cmd\_declare\_cmd\_code\_expandable:Nnn.)

\\_\_cmd\_declare\_env:nnnn  
 \\_\_cmd\_declare\_env\_internal:nnnn

The lead-off to creating an environment is much the same as that for creating a command: issue the appropriate message, store the argument specification then hand off to an internal function.

```

174 \cs_new_protected:Npn \__cmd_declare_env:nnnn #1#2
175 {
176   \str_set:Nx \l__cmd_environment_str {#1}
177   \str_set:Nx \l__cmd_environment_str
178   { \tl_trim_spaces:o { \l__cmd_environment_str } }

```

```

179 \cs_if_exist:cTF { \l__cmd_environment_str }
180 {
181     \msg_info:nnxx { cmd } { redefine-env }
182     { \l__cmd_environment_str } { \tl_to_str:n {#2} }
183 }
184 {
185     \msg_info:nnxx { cmd } { define-env }
186     { \l__cmd_environment_str } { \tl_to_str:n {#2} }
187 }
188 \bool_set_false:N \l__cmd_expandable_bool
189 \bool_set_true:N \l__cmd_environment_bool
190 \exp_args:NV \__cmd_declare_env_internal:nnnn
191 \l__cmd_environment_str {#2}
192 }

```

Creating a document environment requires a few more steps than creating a single command. In order to pass the arguments of the command to the end of the function, it is necessary to store the grabbed arguments. To do that, the function used at the end of the environment has to be redefined to contain the appropriate information. To minimize the amount of expansion at point of use, the code here is expanded now as well as when used. The last argument of `\__cmd_declare_cmd_internal:Nnnn` is only run if the definition succeeded. In package mode this ensures that the original definition of the environment is not changed if the definition fails for any reason. This also avoids an error when defining the `end_au_x_` function when the user asks for more than 9 arguments.

```

193 \cs_new_protected:Npn \__cmd_declare_env_internal:nnnn #1#2#3#4
194 {
195     \exp_args:Nc \__cmd_declare_cmd_internal:Nnnn { environment~ #1 } {#2}
196     {#3}
197     {
198         \cs_set_nopar:cpx { environment~ #1 ~end }
199         { \exp_not:c { environment~ #1 ~end~aux } }
200         \cs_generate_from_arg_count:cNnn
201         { environment~ #1 ~end~aux~ } \cs_set:Npn
202         \l__cmd_current_arg_int {#4}
203         \cs_set_eq:cc {#1} { environment~ #1 }
204         \cs_set_eq:cc { end #1 } { environment~ #1 ~end }
205     }
206 }
207 \cs_new_protected:Npn \__cmd_set_environment_end:n #1
208 {
209     \cs_set_nopar:cpx { environment~ #1 ~end~aux }
210     {
211         \exp_not:c { environment~ #1 ~end~aux~ }
212         \exp_not:o \l__cmd_args_tl
213     }
214 }

```

*(End definition for `\__cmd_declare_env:nnnn` and `\__cmd_declare_env_internal:nnnn`.)*

### 1.3 Structure of `xparse` commands

`\__cmd_start_env:nnnnn` For error messages that occur during run-time when getting arguments of environments it is necessary to keep track of the environment name. We begin non-expandable commands with a token equal to `\scan_stop:`, whose name gives a reasonable error message

if the command is used inside a csname and protects against f-expansion. This is useless for environments since `\begin` is already not expandable. Both the command and environment codes start with `\group_align_safe_begin:`, then `\__cmd_run_code:` (used by both) does `\group_align_safe_end:`, so that delimited arguments may be grabbed in alignments if they contain an alignment tab token (see latex3/latex3/issues/839).

```

215 \cs_new_protected:Npn \__cmd_start_env:nnnnn #1#2
216 {
217   \conditionally@traceoff
218   \group_align_safe_begin:
219   \str_set:Nn \l__cmd_environment_str {#2}
220   \bool_set_true:N \l__cmd_environment_bool
221   \__cmd_start_aux:ccnnnn
222   { environment~ \l__cmd_environment_str \c_space_tl }
223   { environment~ \l__cmd_environment_str \c_space_tl code }
224   {#1}
225 }
226 \cs_new_protected:Npx \__cmd_start:nNNnnn #1#2#3
227 {
228   \exp_not:c { xparse~function~is~not~expandable }
229   \exp_not:N \conditionally@traceoff
230   \exp_not:N \group_align_safe_begin:
231   \exp_not:n { \bool_set_false:N \l__cmd_environment_bool }
232   \exp_not:N \__cmd_start_aux:NNnnnn
233   #2 #3 {#1}
234 }

```

(End definition for `\__cmd_start_env:nnnnn` and `\__cmd_start:nNNnnn`.)

`\__cmd_start_aux:NNnnnn` This sets up a few variables to minimize the boilerplate code included in all xparse-defined commands. It then runs the grabbers #4. Again, the argument specification #1 is only for diagnostics.

`\__cmd_start_aux:ccnnnn`

```

235 \cs_new_protected:Npn \__cmd_start_aux:NNnnnn #1#2#3#4#5#6
236 {
237   \tl_clear:N \l__cmd_args_tl
238   \tl_set:Nn \l__cmd_fn_tl {#1}
239   \tl_set:Nn \l__cmd_fn_code_tl {#2}
240   \tl_set:Nn \l__cmd_defaults_tl {#5}
241   \tl_set:Nn \l__cmd_process_all_tl {#6}
242   #4
243   \__cmd_run_code:
244 }
245 \cs_generate_variant:Nn \__cmd_start_aux:NNnnnn { cc }

```

(End definition for `\__cmd_start_aux:NNnnnn`.)

`\__cmd_run_code:` After arguments are grabbed, this function is responsible for inserting default values, running processors, and finally doing `\group_align_safe_end:` as promised, and running the code.

```

246 \cs_new_protected:Npn \__cmd_run_code:
247 {
248   \tl_if_empty:NF \l__cmd_defaults_tl { \__cmd_defaults: }
249   \tl_if_empty:NF \l__cmd_process_all_tl { \__cmd_args_process: }
250   \bool_if:NT \l__cmd_environment_bool
251   { \exp_args:No \__cmd_set_environment_end:n \l__cmd_environment_str }

```

```

252 \group_align_safe_end:
253 \conditionally@traceon
254 \exp_after:wN \l__cmd_fn_code_tl \l__cmd_args_tl
255 }

```

(End definition for \\_\_cmd\_run\_code:.)

\\_\_cmd\_defaults: First construct \\_\_cmd\_tmp:w (see below) that will receive the arguments found so far and determine default values for any missing argument. Then call it repeatedly until the set of arguments stabilizes. Since that could lead to an infinite loop we only call it up to nine times, the maximal number needed for stabilization if there is a chain of arguments that depend on each other. If that fails to stabilize raise an error.

```

\__cmd_defaults_def:nn
\__cmd_defaults_def:nnn
\__cmd_defaults_aux:
\__cmd_defaults_error:w
256 \cs_new_protected:Npn \__cmd_defaults:
257 {
258   \__cmd_defaults_def:
259   \tl_set_eq:NN \l__cmd_args_i_tl \l__cmd_args_tl
260   \__cmd_defaults_aux: \__cmd_defaults_aux: \__cmd_defaults_aux:
261   \__cmd_defaults_aux: \__cmd_defaults_aux: \__cmd_defaults_aux:
262   \__cmd_defaults_aux: \__cmd_defaults_aux: \__cmd_defaults_aux:
263   \__cmd_defaults_error:w
264   \q_recursion_stop
265   \tl_set_eq:NN \l__cmd_args_tl \l__cmd_args_i_tl
266 }
267 \cs_new_protected:Npn \__cmd_defaults_aux:
268 {
269   \tl_set:Nx \l__cmd_args_ii_tl
270   { \exp_after:wN \__cmd_tmp:w \l__cmd_args_i_tl }
271   \tl_if_eq:NNT \l__cmd_args_ii_tl \l__cmd_args_i_tl
272   { \use_none_delimit_by_q_recursion_stop:w }
273   \tl_set_eq:NN \l__cmd_args_i_tl \l__cmd_args_ii_tl
274 }
275 \cs_new_protected:Npn \__cmd_defaults_error:w \q_recursion_stop
276 {
277   \msg_error:nnx { cmd } { default-loop }
278   { \__cmd_environment_or_command: }
279 }

```

To construct \\_\_cmd\_tmp:w, first go through the arguments found and the corresponding defaults, building a token list with {#(arg number)} for arguments found in the input (whose default will not be used) and otherwise {\exp\_not:n{<default>}} for arguments whose default will be used.

```

280 \cs_new_protected:Npn \__cmd_defaults_def:
281 {
282   \tl_clear:N \l__cmd_tmpa_tl
283   \int_zero:N \l__cmd_current_arg_int
284   \__cmd_tl_mapthread_function:NNN \l__cmd_args_tl \l__cmd_defaults_tl
285   \__cmd_defaults_def:nn
286   \cs_generate_from_arg_count:NNVo \__cmd_tmp:w \cs_set:Npn
287   \l__cmd_current_arg_int \l__cmd_tmpa_tl
288 }
289 \cs_generate_variant:Nn \cs_generate_from_arg_count:NNnn { NNVo }
290 \cs_new_protected:Npn \__cmd_defaults_def:nn
291 {
292   \int_incr:N \l__cmd_current_arg_int

```

```

293 \exp_args:NV \__cmd_defaults_def:nnn \l__cmd_current_arg_int
294 }
295 \cs_new_protected:Npn \__cmd_defaults_def:nnn #1#2#3
296 {
297   \tl_put_right:Nx \l__cmd_tmpa_tl
298   {
299     {
300       \exp_not:N \exp_not:n
301       {
302         \tl_if_novalue:nTF {#2}
303         { \exp_not:o {#3} }
304         { \exp_not:n { ## #1 } }
305       }
306     }
307   }
308 }

```

(End definition for \\_\_cmd\_defaults: and others.)

\\_\_cmd\_args\_process: Loop through arguments (stored in \l\_\_cmd\_args\_tl) and the corresponding processors (in \l\_\_cmd\_process\_all\_tl) simultaneously, apply all processors for each argument and store the result back into \l\_\_cmd\_args\_tl. To allow processors to depend on other arguments, for every processor define a temporary auxiliary that receives all arguments \l\_\_cmd\_args\_tl.

```

309 \cs_new_protected:Npn \__cmd_args_process:
310 {
311   \tl_clear:N \l__cmd_args_ii_tl
312   \__cmd_tl_mapthread_function:NNN
313     \l__cmd_args_tl
314     \l__cmd_process_all_tl
315     \__cmd_args_process_loop:nn
316   \tl_set_eq:NN \l__cmd_args_tl \l__cmd_args_ii_tl
317 }
318 \cs_new_protected:Npn \__cmd_args_process_loop:nn #1#2
319 {
320   \tl_set:Nn \ProcessedArgument {#1}
321   \tl_if_novalue:nF {#1}
322   { \tl_map_function:nN {#2} \__cmd_args_process_aux:n }
323   \tl_put_right:No \l__cmd_args_ii_tl
324   { \exp_after:wN { \ProcessedArgument } }
325 }
326 \cs_new_protected:Npn \__cmd_args_process_aux:n #1
327 {
328   \cs_generate_from_arg_count:NNnn \__cmd_tmp:w \cs_set:Npn
329   { \tl_count:N \l__cmd_args_tl } {#1}
330   \exp_args:NNNo \exp_after:wN \__cmd_tmp:w \l__cmd_args_tl
331   { \ProcessedArgument }
332 }

```

(End definition for \\_\_cmd\_args\_process:, \\_\_cmd\_args\_process\_loop:nn, and \\_\_cmd\_args\_process\_aux:n.)

\\_\_cmd\_start\_expandable:nnNNNn This is called for all expandable commands. #6 is the signature, responsible for grabbing arguments. #5 is used to determine default values (or is ? if there are none). #4 is

the code to run. #2 and #3 are functions (named after the command) that grab a single argument in the input stream (#3 is short). The argument specification #1 is only used by diagnostic functions. Same as for the non-expandable version, this starts with `\group_align_safe_begin:`, which expands to nothing, so may be safely used in an expandable context.

```

333 \cs_new:Npn \__cmd_start_expandable:nNNNNn #1#2#3#4#5#6
334 {
335   \group_align_safe_begin:
336   #6 \__cmd_end_expandable:NNw #5 #4 \q__cmd #2#3
337 }

```

(End definition for `\__cmd_start_expandable:nNNNNn`.)

```

\__cmd_end_expandable:NNw
\__cmd_end_expandable_aux:w
  \__cmd_end_expandable_aux:nNNNN
\__cmd_end_expandable_defaults:nnnNNn
  \__cmd_end_expandable_defaults:nnw
  \__cmd_end_expandable_defaults:nw

```

Followed by a function #1 to determine default values (or ? if there are no defaults), the code #2, arguments that have been grabbed, then `\q__cmd` and two generic grabbers. The idea to find default values is similar to the non-expandable case but we cannot define an auxiliary function, so at every step in the loop we need to go through all arguments searching for which ones started out as `-NoValue-` and replacing these by the newly computed values. In fact we need to keep track of three versions of all arguments: the original version, the previous version with default values, and the currently built version (first argument of `\__cmd_end_expandable_defaults:nnnNNn`).

```

338 \cs_new:Npn \__cmd_end_expandable:NNw #1#2
339 { \__cmd_end_expandable_aux:w #1#2 \prg_do_nothing: }
340 \cs_new:Npn \__cmd_end_expandable_aux:w #1#2#3 \q__cmd
341 { \exp_args:No \__cmd_end_expandable_aux:nNNNN {#3} #1 #2 }
342 \cs_new:Npn \__cmd_end_expandable_aux:nNNNN #1#2#3#4#5
343 {
344   \token_if_eq_charcode:NNT ? #2 { \exp_after:wN \use_iv:nnnn }
345   \__cmd_end_expandable_defaults:nnnNNn {#1} { } {#1} #2#3
346   { } { } { } { } { } { } { } { } { } { } { } { } { } { }
347   {
348     \msg_expandable_error:nmf { cmd } { default-loop }
349     { \exp_args:Nf \tl_trim_spaces:n { \token_to_str:N #4 } }
350     \use_iv:nnnn
351   }
352   \q_stop
353 }
354 \cs_new:Npn \__cmd_end_expandable_defaults:nnnNNn #1#2#3#4#5#6
355 {
356   #6
357   \str_if_eq:nnTF {#1} {#2}
358   { \use_i_delimit_by_q_stop:nw { \group_align_safe_end: #5 #1 } }
359   {
360     \exp_args:No \__cmd_tl_mapthread_function:nnN
361     { #4 #1 } {#3}
362     \__cmd_end_expandable_defaults:nnw
363     \__cmd_end_expandable_defaults:nnnNNn { } {#1} {#3} #4 #5
364   }
365 }
366 \cs_new:Npn \__cmd_end_expandable_defaults:nnw #1#2
367 {
368   \tl_if_novalue:nTF {#2}
369   { \exp_args:No \__cmd_end_expandable_defaults:nw {#1} }

```

```

370     { \_cmd_end_expandable_defaults:nw {#2} }
371   }
372 \cs_new:Npn \_cmd_end_expandable_defaults:nw
373     #1#2 \_cmd_end_expandable_defaults:nnnNNn #3
374   { #2 \_cmd_end_expandable_defaults:nnnNNn { #3 {#1} } }

```

(End definition for `\_cmd_end_expandable:NNw` and others.)

## 1.4 Normalizing the argument specifications

The goal here is to expand aliases and check that the argument specification is valid before the main parsing run. If it is not valid the entire set up is abandoned to avoid any strange internal errors. A function is provided for each argument type that will grab any extra data items and call the loop function after performing the following checks and tasks.

- Check that each argument has the correct number of data items associated with it, and that where a single character is required, one has actually been supplied.
- Check that processors and the markers `+` and `!` are followed by an argument for which they make sense, and are not redundant.
- Check the absence of forbidden types for expandable commands, namely `G/v` always, and `l/u` after optional arguments (`xparse` may have inserted braces due to a failed search for an optional argument).
- Check that no optional argument is followed by a mandatory argument with the same delimiter, as otherwise the optional argument could never be omitted.
- Keep track in `\l__cmd_some_long_bool` and `\l__cmd_some_short_bool` of whether the command has some long/short arguments.
- Keep track in `\l__cmd_grab_expandably_bool` of whether all arguments are `m/l/u` type and short arguments appear before long ones, in which case they can be grabbed expandably just as safely as they could be grabbed nonexpandably. Regardless of that, arguments of expandable commands will be grabbed expandably and arguments of environments will not (because the list of arguments built by non-expandable grabbing is used to pass them to the end-environment code).

Further checks happen at the end of the loop:

- that there are at most 9 arguments;
- that an expandable command does not end with an optional argument (this case is detected by using the fact that `\l__cmd_last_delimiters_tl` is cleared by every mandatory argument and filled by every optional argument).

`\_cmd_normalize_arg_spec:n` Loop through the argument specification, calling an auxiliary specific to each argument type. If any argument is unknown stop the definition.

`\_cmd_normalize_arg_spec_loop:n`

```

375 \cs_new_protected:Npn \_cmd_normalize_arg_spec:n #1
376   {
377     \int_zero:N \l__cmd_current_arg_int
378     \tl_clear:N \l__cmd_last_delimiters_tl
379     \tl_clear:N \l__cmd_arg_spec_tl

```



```

380 \bool_set_true:N \l__cmd_grab_expandably_bool
381 \bool_set_false:N \l__cmd_obey_spaces_bool
382 \bool_set_false:N \l__cmd_long_bool
383 \bool_set_false:N \l__cmd_some_obey_spaces_bool
384 \bool_set_false:N \l__cmd_some_long_bool
385 \bool_set_false:N \l__cmd_some_short_bool
386 \__cmd_normalize_arg_spec_loop:n #1
387 \q_recursion_tail \q_recursion_tail \q_recursion_tail \q_recursion_stop
388 \int_compare:nNnT \l__cmd_current_arg_int > 9
389 {
390   \msg_error:nnxx { cmd } { too-many-args }
391   { \__cmd_environment_or_command: } { \tl_to_str:n {#1} }
392   \__cmd_bad_def:wn
393 }
394 \bool_if:NT \l__cmd_expandable_bool
395 {
396   \tl_if_empty:NF \l__cmd_last_delimiters_tl
397   {
398     \msg_error:nnxx { cmd } { expandable-ending-optional }
399     { \iow_char:N \ \ \l__cmd_function_tl } { \tl_to_str:n {#1} }
400     \__cmd_bad_def:wn
401   }
402 }
403 \bool_if:NT \l__cmd_expandable_bool
404 { \bool_set_true:N \l__cmd_grab_expandably_bool }
405 \bool_if:NT \l__cmd_environment_bool
406 { \bool_set_false:N \l__cmd_grab_expandably_bool }
407 }
408 \cs_new_protected:Npn \__cmd_normalize_arg_spec_loop:n #1
409 {
410   \quark_if_recursion_tail_stop:n {#1}
411   \int_incr:N \l__cmd_current_arg_int
412   \cs_if_exist_use:cF { __cmd_normalize_type_ \tl_to_str:n {#1} :w }
413   {
414     \bool_lazy_any:nTF
415     {
416       { \str_if_eq_p:nn {#1} { G } }
417       { \str_if_eq_p:nn {#1} { g } }
418       { \str_if_eq_p:nn {#1} { l } }
419       { \str_if_eq_p:nn {#1} { u } }
420     }
421     {
422       \msg_error:nnxx { cmd } { xparse-arg-type }
423       { \__cmd_environment_or_command: } { \tl_to_str:n {#1} }
424     }
425     {
426       \msg_error:nnxx { cmd } { unknown-argument-type }
427       { \__cmd_environment_or_command: } { \tl_to_str:n {#1} }
428     }
429     \__cmd_bad_def:wn
430   }
431 }

```

(End definition for \\_\_cmd\_normalize\_arg\_spec:n and \\_\_cmd\_normalize\_arg\_spec\_loop:n.)

`\__cmd_normalize_type_d:w` These argument types are aliases of more general ones, for example with the default  
`\__cmd_normalize_type_e:w` argument `-NoValue-`. To easily insert that marker expanded in the definitions we call  
`\__cmd_normalize_type_o:w` `\__cmd_tmp:w` with the argument `-NoValue-`. For argument types that need additional  
`\__cmd_normalize_type_0:w` data, check that the data is present (not `\q_recursion_tail`) before proceeding.

```

432 \cs_set_protected:Npn \__cmd_tmp:w #1
433 {
434   \cs_new_protected:Npn \__cmd_normalize_type_d:w ##1##2
435   {
436     \quark_if_recursion_tail_stop_do:nn {##2} { \__cmd_bad_arg_spec:wn }
437     \__cmd_normalize_type_D:w {##1} {##2} {#1}
438   }
439   \cs_new_protected:Npn \__cmd_normalize_type_e:w ##1
440   {
441     \quark_if_recursion_tail_stop_do:nn {##1} { \__cmd_bad_arg_spec:wn }
442     \__cmd_normalize_type_E:w {##1} { }
443   }
444   \cs_new_protected:Npn \__cmd_normalize_type_o:w
445   { \__cmd_normalize_type_D:w [ ] {#1} }
446   \cs_new_protected:Npn \__cmd_normalize_type_0:w
447   { \__cmd_normalize_type_D:w [ ] }
448   \cs_new_protected:Npn \__cmd_normalize_type_r:w ##1##2
449   {
450     \quark_if_recursion_tail_stop_do:nn {##2} { \__cmd_bad_arg_spec:wn }
451     \__cmd_normalize_type_R:w {##1} {##2} {#1}
452   }
453   \cs_new_protected:Npn \__cmd_normalize_type_s:w
454   { \__cmd_normalize_type_t:w * }
455 }
456 \exp_args:No \__cmd_tmp:w { \c_novalue_tl }
  
```

(End definition for `\__cmd_normalize_type_d:w` and others.)

`\__cmd_normalize_type_>:w` Check that these prefixes have arguments, namely that the next token is not `\q_`  
`\__cmd_normalize_type_+:w` `recursion_tail`, and remember to leave it after the looping macro. Processors are  
`\__cmd_normalize_type_!:w` forbidden in expandable commands. If all is good, store the prefix in the cleaned up  
`\l__cmd_arg_spec_tl`, and decrement the argument number as prefixes do not corre-  
 spond to arguments.

```

457 \cs_new_protected:cpn { __cmd_normalize_type_>:w } #1#2
458 {
459   \quark_if_recursion_tail_stop_do:nn {#2} { \__cmd_bad_arg_spec:wn }
460   \bool_if:NT \l__cmd_expandable_bool
461   {
462     \msg_error:nnxx { cmd } { processor-in-expandable }
463     { \iow_char:N \ \ \l__cmd_function_tl } { \tl_to_str:n {#1} }
464     \__cmd_bad_def:wn
465   }
466   \tl_put_right:Nx \l__cmd_arg_spec_tl { > { \tl_trim_spaces:n {#1} } }
467   \int_decr:N \l__cmd_current_arg_int
468   \bool_set_false:N \l__cmd_grab_expandably_bool
469   \__cmd_normalize_arg_spec_loop:n {#2}
470 }
471 \cs_new_protected:cpn { __cmd_normalize_type_+:w } #1
472 {
  
```

```

473 \quark_if_recursion_tail_stop_do:nn {#1} { \__cmd_bad_arg_spec:wn }
474 \bool_if:NT \l__cmd_long_bool
475 {
476   \msg_error:nnxx { cmd } { two-markers }
477   { \__cmd_environment_or_command: } { + }
478   \__cmd_bad_def:wn
479 }
480 \bool_set_true:N \l__cmd_long_bool
481 \int_decr:N \l__cmd_current_arg_int
482 \__cmd_normalize_arg_spec_loop:n {#1}
483 }
484 \cs_new_protected:cpn { __cmd_normalize_type_! :w } #1
485 {
486   \quark_if_recursion_tail_stop_do:nn {#1} { \__cmd_bad_arg_spec:wn }
487   \bool_if:NT \l__cmd_obey_spaces_bool
488   {
489     \msg_error:nnxx { cmd } { two-markers }
490     { \__cmd_environment_or_command: } { ! }
491     \__cmd_bad_def:wn
492   }
493   \bool_set_true:N \l__cmd_obey_spaces_bool
494   \bool_set_true:N \l__cmd_some_obey_spaces_bool
495   \int_decr:N \l__cmd_current_arg_int
496   \__cmd_normalize_arg_spec_loop:n {#1}
497 }

```

(End definition for \\_\_cmd\_normalize\_type\_>:w, \\_\_cmd\_normalize\_type\_+:w, and \\_\_cmd\_normalize\_type\_! :w.)

\\_\_cmd\_normalize\_type\_D:w  
 \\_\_cmd\_normalize\_type\_E:w  
 \\_\_cmd\_normalize\_type\_t:w  
 \\_\_cmd\_normalize\_E\_unique\_check:w

Optional argument types. Check that all required data is present (and consists of single characters if applicable) and check for forbidden types for expandable commands. For E-type require that there is at least one embellishment, that each one is a single character, and that there aren't more optional arguments than embellishments; also remember that each embellishment counts as one argument for \l\_\_cmd\_current\_arg\_int. Then in each case store the data in \l\_\_cmd\_arg\_spec\_tl, and for later checks store in \l\_\_cmd\_last\_delimiters\_tl the tokens whose presence determines whether there is an optional argument (for braces store {}, seen later as an empty delimiter).

```

498 \cs_new_protected:Npn \__cmd_normalize_type_D:w #1#2#3
499 {
500   \quark_if_recursion_tail_stop_do:nn {#3} { \__cmd_bad_arg_spec:wn }
501   \__cmd_single_token_check:n {#1} \__cmd_allowed_token_check:N #1
502   \__cmd_single_token_check:n {#2}
503   \__cmd_add_arg_spec:n { D #1 #2 {#3} }
504   \tl_put_right:Nn \l__cmd_last_delimiters_tl {#1}
505   \bool_set_false:N \l__cmd_grab_expandably_bool
506   \__cmd_normalize_arg_spec_loop:n
507 }
508 \cs_new_protected:Npn \__cmd_normalize_type_E:w #1#2
509 {
510   \quark_if_recursion_tail_stop_do:nn {#2} { \__cmd_bad_arg_spec:wn }
511   \tl_if_blank:nT {#1} { \__cmd_bad_arg_spec:wn }
512   \tl_map_function:nN {#1} \__cmd_single_token_check:n
513   \tl_map_function:nN {#1} \__cmd_allowed_token_check:N
514   \__cmd_normalize_E_unique_check:w #1 \q_nil \q_stop

```

```

515 \int_compare:nNnT { \tl_count:n {#2} } > { \tl_count:n {#1} }
516 { \__cmd_bad_arg_spec:wn }
517 \__cmd_add_arg_spec:n { E {#1} {#2} }
518 \tl_put_right:Nn \l__cmd_last_delimiters_tl {#1}
519 \bool_set_false:N \l__cmd_grab_expandably_bool
520 \int_add:Nn \l__cmd_current_arg_int { \tl_count:n {#1} - 1 }
521 \__cmd_normalize_arg_spec_loop:n
522 }
523 \cs_new_protected:Npn \__cmd_normalize_E_unique_check:w #1#2 \q_stop
524 {
525   \quark_if_nil:NF #1
526   {
527     \tl_if_in:nnT {#2} {#1} { \__cmd_bad_arg_spec:wn }
528     \__cmd_normalize_E_unique_check:w #2 \q_stop
529   }
530 }
531 \cs_new_protected:Npn \__cmd_normalize_type_t:w #1
532 {
533   \quark_if_recursion_tail_stop_do:Nn #1 { \__cmd_bad_arg_spec:wn }
534   \__cmd_single_token_check:n {#1} \__cmd_allowed_token_check:N #1
535   \tl_put_right:Nx \l__cmd_arg_spec_tl
536   {
537     \bool_if:NT \l__cmd_obey_spaces_bool { ! }
538     t \exp_not:n {#1}
539   }
540   \tl_put_right:Nn \l__cmd_last_delimiters_tl {#1}
541   \bool_set_false:N \l__cmd_grab_expandably_bool
542   \bool_set_false:N \l__cmd_obey_spaces_bool
543   \bool_set_false:N \l__cmd_long_bool
544   \__cmd_normalize_arg_spec_loop:n
545 }

```

(End definition for \\_\_cmd\_normalize\_type\_D:w and others.)

\\_\_cmd\_normalize\_type\_m:w  
 \\_\_cmd\_normalize\_type\_R:w  
 \\_\_cmd\_normalize\_type\_v:w

Mandatory arguments. First check the required data is present, consists of single characters where applicable, and that the argument type is allowed for expandable commands if applicable. For the m and R argument types check that they do not follow some optional argument with that delimiter as otherwise the optional argument could not be omitted. Then save data in \l\_\_cmd\_arg\_spec\_tl, count the mandatory argument, and empty the list of last delimiters.

```

546 \cs_new_protected:Npn \__cmd_normalize_type_m:w
547 {
548   \__cmd_delimiter_check:nnn { } { m } { \iow_char:N \{ }
549   \__cmd_add_arg_spec_mandatory:n { m }
550   \__cmd_normalize_arg_spec_loop:n
551 }
552 \cs_new_protected:Npn \__cmd_normalize_type_R:w #1#2#3
553 {
554   \quark_if_recursion_tail_stop_do:nn {#3} { \__cmd_bad_arg_spec:wn }
555   \__cmd_single_token_check:n {#1} \__cmd_allowed_token_check:N #1
556   \__cmd_single_token_check:n {#2}
557   \__cmd_delimiter_check:nnn {#1} { R/r } { \tl_to_str:n {#1} }
558   \bool_set_false:N \l__cmd_grab_expandably_bool
559   \__cmd_add_arg_spec_mandatory:n { R #1 #2 {#3} }

```

```

560   \__cmd_normalize_arg_spec_loop:n
561 }
562 \cs_new_protected:Npn \__cmd_normalize_type_v:w
563 {
564   \__cmd_normalize_check_gv:N v
565   \__cmd_add_arg_spec_mandatory:n { v }
566   \__cmd_normalize_arg_spec_loop:n
567 }

(End definition for \__cmd_normalize_type_m:w, \__cmd_normalize_type_R:w, and
 \__cmd_normalize_type_v:w.)

```

`\__cmd_normalize_type_b:w` This argument type is not allowed for commands. This is only allowed at the end of the argument specification, hence we check that #1 is the end.

```

568 \cs_new_protected:Npn \__cmd_normalize_type_b:w #1
569 {
570   \bool_if:NF \l__cmd_environment_bool
571   {
572     \msg_error:nnxx { cmd } { invalid-command-arg }
573     { \__cmd_environment_or_command: } { b }
574     \__cmd_bad_def:wn
575   }
576   \tl_clear:N \l__cmd_last_delimiters_tl
577   \__cmd_add_arg_spec:n { b }
578   \quark_if_recursion_tail_stop:n {#1}
579   \msg_error:nnxx { cmd } { arg-after-body }
580   { \__cmd_environment_or_command: }
581   { \tl_to_str:n {#1} }
582   \__cmd_bad_def:wn
583 }

(End definition for \__cmd_normalize_type_b:w.)

```

`\__cmd_single_token_check:n` Checks that the argument is a single (non-space) token (possibly surrounded by spaces), and aborts the definition otherwise.

```

584 \cs_new_protected:Npn \__cmd_single_token_check:n #1
585 {
586   \tl_trim_spaces_apply:nN {#1} \tl_if_single_token:nF
587   {
588     \msg_error:nnxx { cmd } { not-single-token }
589     { \__cmd_environment_or_command: } { \tl_to_str:n {#1} }
590     \__cmd_bad_def:wn
591   }
592 }

(End definition for \__cmd_single_token_check:n.)

```

`\__cmd_allowed_token_check:N` Some tokens are now allowed as delimiters for some argument types, notably implicit begin/end-group tokens (`\bgroup`/`\egroup`). The major problem with these tokens is that for `\peek_...` functions, a literal `{_1}` is virtually indistinguishable from a `\bgroup` or other token which was `\let` to a `{_1}`, and the same goes for `_2`. All other tokens can be easily distinguished from their implicit counterparts by grabbing them and looking at the string length (see `\__cmd_token_if_cs:NTF`), but for begin/end group tokens

that is not possible without the risk of mistakenly grabbing the entire brace group (potentially leading to a ! Runaway argument error) or trying to grab a }<sub>2</sub>, leading to an ! Argument of \dots has an extra } error.

```

593 \cs_new_protected:Npn \__cmd_allowed_token_check:N #1
594 {
595   \token_if_eq_meaning:NNTF #1 \c_group_begin_token
596   { \use:n }
597   {
598     \token_if_eq_meaning:NNTF #1 \c_group_end_token
599     { \use:n }
600     { \use_none:n }
601   }
602   {
603     \msg_error:nnxxx { cmd } { forbidden-group-token }
604     { \__cmd_environment_or_command: } { \tl_to_str:n {#1} }
605     {
606       \token_if_eq_meaning:NNTF #1 \c_group_begin_token
607       { begin } { end }
608     }
609     \__cmd_bad_def:wn
610   }
611 }

```

(End definition for \\_\_cmd\_allowed\_token\_check:N.)

\\_\_cmd\_normalize\_check\_gv:N Called for arguments that are always forbidden, or forbidden after an optional argument,  
 \\_\_cmd\_normalize\_check\_lu:N for expandable commands.

```

612 \cs_new_protected:Npn \__cmd_normalize_check_gv:N #1
613 {
614   \bool_if:NT \l__cmd_expandable_bool
615   {
616     \msg_error:nnxx { cmd } { invalid-expandable-arg }
617     { \iow_char:N \ \ \l__cmd_function_tl } { \tl_to_str:n {#1} }
618     \__cmd_bad_def:wn
619   }
620   \bool_set_false:N \l__cmd_grab_expandably_bool
621 }
622 \cs_new_protected:Npn \__cmd_normalize_check_lu:N #1
623 {
624   \bool_if:NT \l__cmd_expandable_bool
625   {
626     \tl_if_empty:NF \l__cmd_last_delimiters_tl
627     {
628       \msg_error:nnxx { cmd } { invalid-after-optional-expandably }
629       { \iow_char:N \ \ \l__cmd_function_tl } { \tl_to_str:n {#1} }
630       \__cmd_bad_def:wn
631     }
632   }
633 }

```

(End definition for \\_\_cmd\_normalize\_check\_gv:N and \\_\_cmd\_normalize\_check\_lu:N.)

\\_\_cmd\_delimiter\_check:nnn Called for m and R arguments. Checks that the leading token does not coincide with the token denoting the presence of a previous optional argument. Instead of dealing with braces for the m-type we use an empty delimiter to denote that case.

```

634 \cs_new_protected:Npn \__cmd_delimiter_check:nnn #1#2#3
635 {
636   \tl_map_inline:Nn \l__cmd_last_delimiters_tl
637   {
638     \tl_if_eq:nnT {##1} {#1}
639     {
640       \msg_warning:nnxx { cmd } { optional-mandatory }
641       {#2} {#3}
642     }
643   }
644 }

```

(End definition for \\_\_cmd\_delimiter\_check:nnn.)

\\_\_cmd\_bad\_arg\_spec:wn If the argument specification is wrong, this provides an escape from the entire definition process.  
 \\_\_cmd\_bad\_def:wn

```

645 \cs_new_protected:Npn \__cmd_bad_arg_spec:wn #1 \__cmd_break_point:n #2
646 {
647   \msg_error:nnxx { cmd } { bad-arg-spec }
648   { \__cmd_environment_or_command: } { \tl_to_str:n {#2} }
649 }
650 \cs_new_protected:Npn \__cmd_bad_def:wn #1 \__cmd_break_point:n #2 { }

```

(End definition for \\_\_cmd\_bad\_arg\_spec:wn and \\_\_cmd\_bad\_def:wn.)

\\_\_cmd\_add\_arg\_spec:n When adding an argument to the argument specification, set the `some_long` or `some_short` booleans as appropriate and clear the booleans keeping track of + and ! markers. Before that, test for a short argument following some long arguments: this is forbidden for expandable commands and prevents grabbing arguments expandably.

For mandatory arguments do some more work, in particular complain if they were preceeded by !.

```

651 \cs_new_protected:Npn \__cmd_add_arg_spec:n #1
652 {
653   \bool_lazy_and:nnT
654   { ! \l__cmd_long_bool }
655   { \l__cmd_some_long_bool }
656   {
657     \bool_if:NT \l__cmd_expandable_bool
658     {
659       \msg_error:nnx { cmd } { long-short-mix }
660       { \iow_char:N \l__cmd_function_tl }
661       \__cmd_bad_def:wn
662     }
663     \bool_set_false:N \l__cmd_grab_expandably_bool
664   }
665   \bool_if:NTF \l__cmd_long_bool
666   { \bool_set_true:N \l__cmd_some_long_bool }
667   { \bool_set_true:N \l__cmd_some_short_bool }
668   \tl_put_right:Nx \l__cmd_arg_spec_tl
669   {
670     \bool_if:NT \l__cmd_long_bool { + }
671     \bool_if:NT \l__cmd_obey_spaces_bool { ! }
672     \exp_not:n {#1}
673   }

```

```

674     \bool_set_false:N \l__cmd_long_bool
675     \bool_set_false:N \l__cmd_obey_spaces_bool
676   }
677 \cs_new_protected:Npn \__cmd_add_arg_spec_mandatory:n #1
678 {
679     \bool_if:NT \l__cmd_some_obey_spaces_bool
680     {
681         \msg_error:nnxx { cmd } { invalid-bang }
682         { \__cmd_environment_or_command: } { \tl_to_str:n {#1} }
683         \__cmd_bad_def:wn
684     }
685     \tl_clear:N \l__cmd_last_delimiters_tl
686     \__cmd_add_arg_spec:n {#1}
687 }

```

(End definition for \\_\_cmd\_add\_arg\_spec:n and \\_\_cmd\_add\_arg\_spec\_mandatory:n.)

## 1.5 Preparing the signature: general mechanism

```

\__cmd_prepare_signature:n
\__cmd_prepare_signature:N
  \__cmd_prepare_signature_bypass:N

```

Actually creating the signature uses the same loop approach as normalizing the signature. There are first a number of variables which need to be set to track what is going on. Many of these variables are unused when defining expandable commands.

```

688 \cs_new_protected:Npn \__cmd_prepare_signature:n #1
689 {
690     \int_zero:N \l__cmd_current_arg_int
691     \bool_set_false:N \l__cmd_long_bool
692     \bool_set_false:N \l__cmd_obey_spaces_bool
693     \int_zero:N \l__cmd_m_args_int
694     \bool_set_false:N \l__cmd_defaults_bool
695     \tl_clear:N \l__cmd_defaults_tl
696     \tl_clear:N \l__cmd_process_all_tl
697     \tl_clear:N \l__cmd_process_one_tl
698     \bool_set_false:N \l__cmd_process_some_bool
699     \tl_clear:N \l__cmd_signature_tl
700     \__cmd_prepare_signature:N #1 \q_recursion_tail \q_recursion_stop
701     \bool_if:NF \l__cmd_expandable_bool { \__cmd_flush_m_args: }
702 }

```

The main looping function does not take an argument, but carries out the reset on the processor boolean. This is split off from the rest of the process so that when actually setting up processors the flag-reset can be bypassed.

For each known argument type there is an appropriate function to actually do the addition to the signature. These are separate for expandable and standard functions, as the approaches are different.

```

703 \cs_new_protected:Npn \__cmd_prepare_signature:N
704 {
705     \bool_set_false:N \l__cmd_prefixed_bool
706     \__cmd_prepare_signature_bypass:N
707 }
708 \cs_new_protected:Npn \__cmd_prepare_signature_bypass:N #1
709 {
710     \quark_if_recursion_tail_stop:N #1
711     \use:c
712     {

```



```

713     __cmd_add
714     \bool_if:NT \l__cmd_grab_expandably_bool { _expandable }
715     _type_ \token_to_str:N #1 :w
716   }
717 }

```

(End definition for `\__cmd_prepare_signature:n`, `\__cmd_prepare_signature:N`, and `\__cmd_prepare_signature_bypass:N`.)

## 1.6 Setting up a standard signature

Each argument-adding function appends to the signature a grabber (and for some types, the delimiters or default value), except the one for `m` arguments. These are collected and added to the signature all at once by `\__cmd_flush_m_args:`, called for every other argument type. All of the functions then call the loop function `\__cmd_prepare_signature:N`. Default values of arguments are collected by `\__cmd_add_default:n` rather than being stored with the argument; this function and `\__cmd_add_default:` are also responsible for keeping track of `\l__cmd_current_arg_int`.

`\__cmd_add_type+:w` Making the next argument long means setting the flag. The `m` arguments are recorded here as this has to be done for every case where there is then a long argument.

```

718 \cs_new_protected:cpn { __cmd_add_type+:w }
719 {
720   \__cmd_flush_m_args:
721   \bool_set_true:N \l__cmd_long_bool
722   \bool_set_true:N \l__cmd_prefixed_bool
723   \__cmd_prepare_signature_bypass:N
724 }

```

(End definition for `\__cmd_add_type+:w`.)

`\__cmd_add_type!:w` Much the same for controlling trailing optional arguments.

```

725 \cs_new_protected:cpn { __cmd_add_type!:w }
726 {
727   \__cmd_flush_m_args:
728   \bool_set_true:N \l__cmd_obey_spaces_bool
729   \bool_set_true:N \l__cmd_prefixed_bool
730   \__cmd_prepare_signature_bypass:N
731 }

```

(End definition for `\__cmd_add_type!:w`.)

`\__cmd_add_type>:w` When a processor is found, the processor code is stored. It will be used by `\__cmd_args_process:` once arguments are all found. Here too the loop calls `\__cmd_prepare_signature_bypass:N` rather than `\__cmd_prepare_signature:N` so that the flag is not reset.

```

732 \cs_new_protected:cpn { __cmd_add_type>:w } #1
733 {
734   \__cmd_flush_m_args:
735   \bool_set_true:N \l__cmd_prefixed_bool
736   \bool_set_true:N \l__cmd_process_some_bool
737   \tl_put_left:Nn \l__cmd_process_one_tl { {#1} }
738   \__cmd_prepare_signature_bypass:N
739 }

```

(End definition for \\_cmd\_add\_type\_>:w.)

\\_cmd\_add\_type\_b:w

```

740 \cs_new_protected:Npn \_cmd_add_type_b:w
741 {
742   \_cmd_flush_m_args:
743   \_cmd_add_default:
744   \_cmd_add_grabber:N b
745   \_cmd_prepare_signature:N
746 }

```

(End definition for \\_cmd\_add\_type\_b:w.)

\\_cmd\_add\_type\_D:w

```

747 \cs_new_protected:Npn \_cmd_add_type_D:w #1#2#3
748 {
749   \_cmd_flush_m_args:
750   \_cmd_add_default:n {#3}
751   \_cmd_add_grabber:N D
752   \tl_put_right:Nn \l__cmd_signature_tl { #1 #2 }
753   \_cmd_prepare_signature:N
754 }

```

(End definition for \\_cmd\_add\_type\_D:w.)

\\_cmd\_add\_type\_E:w

The E-type argument needs a special handling of default values. Since each embellishment is a separate argument, it also needs to replicate the argument processors for each embellishment argument so that the numbers of arguments and processors remain in sync.

```

755 \cs_new_protected:Npn \_cmd_add_type_E:w #1#2
756 {
757   \_cmd_flush_m_args:
758   \_cmd_add_default_E:nn {#1} {#2}
759   \use:x
760   {
761     \_cmd_replicate_processor:nn { \tl_count:n {#1} }
762     { \exp_not:o \l__cmd_process_one_tl }
763   }
764   \_cmd_add_grabber:N E
765   \tl_put_right:Nn \l__cmd_signature_tl { {#1} }
766   \_cmd_prepare_signature:N
767 }

```

(End definition for \\_cmd\_add\_type\_E:w.)

\\_cmd\_replicate\_processor:nn

In the command's argument processor signature (the final argument of \\_cmd\_start:nnnnnn) there is one braced item for each formal argument (up to nine), and in each of these items there is one braced item for each processor (as many as there were processors declared for a given argument). Something like this:

```

{ % argument processors
  { % argument 1
    { processor 1 } { processor 2 } ... { processor n }

```

```

    } % end argument 1
    { ... } % argument 2
    :
    { ... } % argument n
  } % end argument processors

```

The function `\__cmd_add_grabber:N` adds one single grabber for an argument, and adds the braced item for that one argument. However, in an E-type argument each embellishment requires its own formal argument, so we need to break out of one layer of braces in `\l__cmd_process_one_tl`, add copies of the processor as necessary, and then return the removed brace. The function below does just that: it defines `\l__cmd_process_one_tl` starting with a  $\}_2$  and ending with a  $\{_1$ , so that it adds as many processors as needed when x-expanded.

```

768 \cs_new_protected:Npn \__cmd_replicate_processor:nn #1 #2
769 {
770   \int_compare:nNnF {#1} > { 1 } { \use_none:nnn }
771   \tl_set:Nx \l__cmd_process_one_tl
772   {
773     \exp_not:n { \exp_not:n {#2} \if_false: { \fi: } }
774     \prg_replicate:nn { #1 - 2 }
775     { \exp_not:n { \exp_not:n { {#2} } } }
776     \exp_not:n { { \if_false: } \fi: \exp_not:n {#2} }
777   }
778 }

```

*(End definition for \\_\_cmd\_replicate\_processor:nn.)*

`\__cmd_add_type_m:w`

The `m` type is special as short arguments which are not post-processed are simply counted at this stage. Thus there is a check to see if either of these cases apply. If so, a one-argument grabber is added to the signature. On the other hand, if a standard short argument is required it is simply counted at this stage, to be added later using `\__cmd_flush_m_args:`.

```

779 \cs_new_protected:Npn \__cmd_add_type_m:w
780 {
781   \__cmd_add_default:
782   \bool_if:NTF \l__cmd_prefixed_bool
783   { \__cmd_add_grabber:N m }
784   { \int_incr:N \l__cmd_m_args_int }
785   \__cmd_prepare_signature:N
786 }

```

*(End definition for \\_\_cmd\_add\_type\_m:w.)*

`\__cmd_add_type_R:w`

The `R`-type argument is very similar to the `D`-type.

```

787 \cs_new_protected:Npn \__cmd_add_type_R:w #1#2#3
788 {
789   \__cmd_flush_m_args:
790   \__cmd_add_default:n {#3}
791   \__cmd_add_grabber:N R
792   \tl_put_right:Nn \l__cmd_signature_tl { #1 #2 }
793   \__cmd_prepare_signature:N
794 }

```

(End definition for `\__cmd_add_type_R:w`.)

`\__cmd_add_type_t:w` Setting up a `t` argument means collecting one token for the test, and adding it along with the grabber to the signature.

```

795 \cs_new_protected:Npn \__cmd_add_type_t:w #1
796 {
797   \__cmd_flush_m_args:
798   \__cmd_add_default:
799   \__cmd_add_grabber:N t
800   \tl_put_right:Nn \l__cmd_signature_tl {#1}
801   \__cmd_prepare_signature:N
802 }
```

(End definition for `\__cmd_add_type_t:w`.)

`\__cmd_add_type_v:w` At this stage, the `v` argument is identical to `l` except that since the grabber may fail to read a verbatim argument we need a default value.

```

803 \cs_new_protected:Npn \__cmd_add_type_v:w
804 {
805   \__cmd_flush_m_args:
806   \exp_args:No \__cmd_add_default:n \c_novalue_tl
807   \__cmd_add_grabber:N v
808   \__cmd_prepare_signature:N
809 }
```

(End definition for `\__cmd_add_type_v:w`.)

`\__cmd_flush_m_args:` As `m` arguments are simply counted, there is a need to add them to the token register in a block. As this function can only be called if something other than `m` turns up, the flag can be switched here.

```

810 \cs_new_protected:Npn \__cmd_flush_m_args:
811 {
812   \int_compare:nNnT \l__cmd_m_args_int > 0
813   {
814     \tl_put_right:Nx \l__cmd_signature_tl
815     { \exp_not:c { __cmd_grab_m_ \int_use:N \l__cmd_m_args_int :w } }
816     \tl_put_right:Nx \l__cmd_process_all_tl
817     { \prg_replicate:nn { \l__cmd_m_args_int } { { } } }
818   }
819   \int_zero:N \l__cmd_m_args_int
820 }
```

(End definition for `\__cmd_flush_m_args:`.)

`\__cmd_add_grabber:N` To keep the various checks needed in one place, adding the grabber to the signature is done here. The only questions are whether the grabber should be long or not, and whether to obey spaces. The `\l__cmd_obey_spaces_bool` boolean can only be `true` for trailing optional arguments. In that case spaces will not be ignored when looking for that optional argument.

```

821 \cs_new_protected:Npn \__cmd_add_grabber:N #1
822 {
823   \tl_put_right:Nx \l__cmd_signature_tl
824   {
825     \exp_not:c
```

```

826     {
827         __cmd_grab_ #1
828         \bool_if:NT \l__cmd_long_bool { _long }
829         \bool_if:NT \l__cmd_obey_spaces_bool { _obey_spaces }
830         :w
831     }
832 }
833 \bool_set_false:N \l__cmd_long_bool
834 \bool_set_false:N \l__cmd_obey_spaces_bool
835 \tl_put_right:Nx \l__cmd_process_all_tl
836 {
837     {
838         \if_charcode:w E #1 \use_i:nn \fi:
839         \exp_not:o \l__cmd_process_one_tl
840     }
841 }
842 \tl_clear:N \l__cmd_process_one_tl
843 }

```

(End definition for \\_\_cmd\_add\_grabber:N.)

\\_\_cmd\_add\_default:n Store the default value of an argument, or rather code that gives that default value (it may involve other arguments). This is \c\_novalue\_tl for arguments with no actual default or with default -NoValue-; and (in a brace group) \prg\_do\_nothing: followed by a default value for others. For E-type arguments, pad the defaults #2 with some \c\_novalue\_tl until there are as many as embellishments #1. These functions are also used when defining expandable commands.

```

844 \cs_new_protected:Npn \__cmd_add_default:n #1
845 {
846     \tl_if_novalue:nTF {#1}
847     { \__cmd_add_default: }
848     {
849         \int_incr:N \l__cmd_current_arg_int
850         \bool_set_true:N \l__cmd_defaults_bool
851         \tl_put_right:Nn \l__cmd_defaults_tl { { \prg_do_nothing: #1 } }
852     }
853 }
854 \cs_new_protected:Npn \__cmd_add_default:
855 {
856     \int_incr:N \l__cmd_current_arg_int
857     \tl_put_right:Nn \l__cmd_defaults_tl { \c_novalue_tl }
858 }
859 \cs_new_protected:Npn \__cmd_add_default_E:nn #1#2
860 {
861     \tl_map_function:nN {#2} \__cmd_add_default:n
862     \prg_replicate:nn
863     { \tl_count:n {#1} - \tl_count:n {#2} }
864     { \__cmd_add_default: }
865 }

```

(End definition for \\_\_cmd\_add\_default:n, \\_\_cmd\_add\_default:, and \\_\_cmd\_add\_default\_E:nn.)

## 1.7 Setting up expandable types

The approach here is not dissimilar to that for standard types, but fewer types are supported. There is also a need to define the per-function auxiliaries: this is done here, while the general grabbers are dealt with later.

`\_cmd_add_expandable_type_+ :w` We have already checked that short arguments are before long arguments, so `\l\_cmd_long_bool` only changes from `false` to `true` once (and there is no need to reset it after each argument). Continue the loop.

```
866 \cs_new_protected:cpn { \_cmd_add_expandable_type_+ :w }
867 {
868   \bool_set_true:N \l\_cmd_long_bool
869   \_cmd_prepare_signature:N
870 }
```

(End definition for `\_cmd_add_expandable_type_+ :w`.)

`\_cmd_add_expandable_type_D :w`  
`\_cmd_add_expandable_type_D_aux :NNNn`  
`\_cmd_add_expandable_type_D_aux :NNN`  
`\_cmd_add_expandable_type_D_aux :NN` The set up for D-type arguments involves constructing a rather complex auxiliary which is used repeatedly when grabbing. There is an auxiliary here so that the R-type can share code readily: #1 is D or R. The `_aux :NN` auxiliary is needed if the two delimiting tokens are identical: in contrast to the non-expandable route, the grabber here has to act differently for this case.

```
871 \cs_new_protected:Npn \_cmd_add_expandable_type_D :w
872 { \_cmd_add_expandable_type_D_aux :NNNn D }
873 \cs_new_protected:Npn \_cmd_add_expandable_type_D_aux :NNNn #1#2#3#4
874 {
875   \_cmd_add_default:n {#4}
876   \tl_if_eq:nnTF {#2} {#3}
877   { \_cmd_add_expandable_type_D_aux :NN #1 #2 }
878   { \_cmd_add_expandable_type_D_aux :NNN #1 #2 #3 }
879   \_cmd_prepare_signature:N
880 }
881 \cs_new_protected:Npn \_cmd_add_expandable_type_D_aux :NNN #1#2#3
882 {
883   \bool_if:NTF \l\_cmd_long_bool
884   { \cs_set:cpx }
885   { \cs_set_nopar:cpx }
886   { \l\_cmd_expandable_aux_name_tl } ##1 ##2 #2 ##3 \q\_cmd ##4 #3
887   { ##1 {##2} {##3} {##4} }
888   \_cmd_add_expandable_grabber:nn {#1}
889   {
890     \exp_not:c { \l\_cmd_expandable_aux_name_tl }
891     \exp_not:n { #2 #3 }
892   }
893 }
894 \cs_new_protected:Npn \_cmd_add_expandable_type_D_aux :NN #1#2
895 {
896   \bool_if:NTF \l\_cmd_long_bool
897   { \cs_set:cpx }
898   { \cs_set_nopar:cpx }
899   { \l\_cmd_expandable_aux_name_tl } ##1 #2 ##2 #2
900   { ##1 {##2} }
901   \_cmd_add_expandable_grabber:nn { #1_alt }
902   {
```

```

903     \exp_not:c { \l__cmd_expandable_aux_name_tl }
904     \exp_not:n {#2}
905   }
906 }

```

(End definition for `\__cmd_add_expandable_type_D:w` and others.)

`\__cmd_add_expandable_type_E:w`  
`\__cmd_add_expandable_type_E_aux:n`

For each embellishment, use `\__cmd_get_grabber:NN` to obtain an auxiliary delimited by that token and store a pair constituted of the auxiliary and the token in `\l__cmd_tmpb_tl`, before appending the whole set of these pairs to the signature, and an equal number of `-NoValue-` markers (regardless of the default values of arguments). Set the current argument appropriately.

```

907 \cs_new_protected:Npn \__cmd_add_expandable_type_E:w #1#2
908 {
909   \__cmd_add_default_E:nn {#1} {#2}
910   \tl_clear:N \l__cmd_tmpb_tl
911   \tl_map_function:nN {#1} \__cmd_add_expandable_type_E_aux:n
912   \__cmd_add_expandable_grabber:nn
913   { E \bool_if:NT \l__cmd_long_bool { _long } }
914   {
915     { \exp_not:o \l__cmd_tmpb_tl }
916     {
917       \prg_replicate:nn { \tl_count:n {#1} }
918       { { \c_novalue_tl } }
919     }
920   }
921   \__cmd_prepare_signature:N
922 }
923 \cs_new_protected:Npn \__cmd_add_expandable_type_E_aux:n #1
924 {
925   \__cmd_get_grabber:NN #1 \l__cmd_tmpa_tl
926   \tl_put_right:Nx \l__cmd_tmpb_tl
927   { \exp_not:o \l__cmd_tmpa_tl \exp_not:N #1 }
928 }

```

(End definition for `\__cmd_add_expandable_type_E:w` and `\__cmd_add_expandable_type_E_aux:n`.)

`\__cmd_add_expandable_type_m:w`

Unlike the standard case, when working expandably each argument is always grabbed separately.

```

929 \cs_new_protected:Npn \__cmd_add_expandable_type_m:w
930 {
931   \__cmd_add_default:
932   \__cmd_add_expandable_grabber:nn
933   { m \bool_if:NT \l__cmd_long_bool { _long } } { }
934   \__cmd_prepare_signature:N
935 }

```

(End definition for `\__cmd_add_expandable_type_m:w`.)

`\__cmd_add_expandable_type_R:w`

The R-type is very similar to the D-type argument, and so the same internals are used.

```

936 \cs_new_protected:Npn \__cmd_add_expandable_type_R:w
937 { \__cmd_add_expandable_type_D_aux:NNNn R }

```

(End definition for `\__cmd_add_expandable_type_R:w`.)

\\_cmd\_add\_expandable\_type\_t:w

An auxiliary delimited by #1 is built now. It will be used to test for the presence of that token.

```
938 \cs_new_protected:Npn \_cmd_add_expandable_type_t:w #1
939 {
940   \__cmd_add_default:
941   \__cmd_get_grabber:NN #1 \l__cmd_tmpa_tl
942   \_cmd_add_expandable_grabber:nn { t }
943   {
944     \exp_not:o \l__cmd_tmpa_tl
945     \exp_not:N #1
946   }
947   \__cmd_prepare_signature:N
948 }
```

(End definition for \\_cmd\_add\_expandable\_type\_t:w.)

\\_cmd\_add\_expandable\_grabber:nn

This is called for all arguments to place the right grabber in the signature.

```
949 \cs_new_protected:Npn \_cmd_add_expandable_grabber:nn #1#2
950 {
951   \tl_put_right:Nx \l__cmd_signature_tl
952   { \exp_not:c { __cmd_expandable_grab_ #1 :w } #2 }
953 }
```

(End definition for \\_cmd\_add\_expandable\_grabber:nn.)

\\_\_cmd\_get\_grabber:NN

\\_\_cmd\_get\_grabber\_auxi:NN

\\_\_cmd\_get\_grabber\_auxii:NN

Given a token #1, defines an expandable function delimited by that token and stores it in the token list #2. The function is named after the token, unless that function name is already taken by some other grabber (this can happen in the rare case where delimiters with different category codes are used in the same document): in that case use a global counter to get a unique name. Since the grabbers are not named after xparse commands they should not be used to get material from the input stream.

```
954 \cs_new_protected:Npn \__cmd_get_grabber:NN #1#2
955 {
956   \cs_set:Npn \__cmd_tmp:w ##1 #1 {##1}
957   \exp_args:Nc \__cmd_get_grabber_auxi:NN
958   { __cmd_grabber_ \token_to_str:N #1 :w } #2
959 }
960 \cs_new_protected:Npn \__cmd_get_grabber_auxi:NN #1#2
961 {
962   \cs_if_eq:NNTF \__cmd_tmp:w #1
963   { \tl_set:Nn #2 {#1} }
964   {
965     \cs_if_exist:NTF #1
966     {
967       \int_gincr:N \g__cmd_grabber_int
968       \exp_args:Nc \__cmd_get_grabber_auxi:NN
969       {
970         __cmd_grabber_
971         - \int_use:N \g__cmd_grabber_int :w
972       }
973       #2
974     }
975     { \__cmd_get_grabber_auxii:NN #1 #2 }
976   }
```



```

977 }
978 \cs_new_protected:Npn \__cmd_get_grabber_auxii:NN #1#2
979 {
980   \cs_set_eq:NN #1 \__cmd_tmp:w
981   \tl_set:Nn #2 {#1}
982 }

```

(End definition for \\_\_cmd\_get\_grabber:NN, \\_\_cmd\_get\_grabber\_auxi:NN, and \\_\_cmd\_get\_grabber\_auxii:NN.)

### 1.7.1 Copying a command and its internal structure

```

983 <latexrelease>\IncludeInRelease{2021/11/15}{\__cmd_copy:NN}%
984 <latexrelease> {Support~\NewCommandCopy~in~ltxcmd}

```

Since the 2020-10-01 L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> release, support for copying, and showing the definition of, robust commands has been available, but the specifics of each command are implemented separately. Here we'll add support for copying and showing ltxcmd definitions.

To fully support copying, we need two commands: a conditional to test if a command is in fact a ltxcmd command, and another command to actually copy the command. The conditional is defined later as \\_\_kernel\_cmd\_if\_xparse:NTF, so now to the copying:

This macro just branches to the proper copying command by using \\_\_cmd\_cmd\_type\_cases:NnnnnF. The copying command takes the names of the commands to be copied to and from, and the actual commands as its four arguments.

```

\__cmd_copy:NN
\__cmd_set_eq_if_exist:NN
\__cmd_set_eq_if_exist:cc

```

```

985 \cs_new_protected:Npn \__cmd_copy:NN #1 #2
986 {
987   \use:x
988   {
989     \int_set:Nn \tex_escapechar:D { 92 }
990     \exp_not:N \__cmd_cmd_type_cases:NnnnnF \exp_not:N #2
991     { \__cmd_copy_command:nnNN }
992     { \__cmd_copy_expandable:nnNN }
993     { \__cmd_copy_environment:nnNN }
994     { \__cmd_copy_environment_end:nnNN }
995     { \__cmd_cant_copy:nwn { non-ltxcmd } }
996     { \cs_to_str:N #1 } { \cs_to_str:N #2 }
997     \exp_not:N #1 \exp_not:N #2
998     \exp_not:N \__cmd_break_point:n { \cs_to_str:N #2 }
999     \int_set:Nn \tex_escapechar:D { \int_use:N \tex_escapechar:D }
1000   }
1001 }
1002 \cs_new_protected:Npn \__cmd_set_eq_if_exist:NN #1 #2
1003 { \cs_if_exist:NTF #2 { \cs_set_eq:NN } { \use_none:nn } #1 #2 }
1004 \cs_generate_variant:Nn \__cmd_set_eq_if_exist:NN { cc }

```

An utility macro similar to \\_\_cmd\_bad\_def:wn to abort a command copy. Contrary to \\_\_cmd\_bad\_def:wn though, when this happens the issue is most likely internal, because the command was already (supposedly) correctly defined so it should be copyable. Hopefully this macro will never be used ever, but if it does, apologise and give the reason for the failure so the user can report.

```

\__cmd_cant_copy:nwn

```

```

1005 \cs_new_protected:Npn \__cmd_cant_copy:nwn #1 #2 \__cmd_break_point:n #3
1006 { \msg_error:nnnn { cmd } { copy-bug } {#1} {#3} }
1007 \msg_new:nnn { cmd } { copy-bug }

```

```

1008 {
1009   Error-while-copying-command~\iow_char:N\#2:\
1010   \str_case:nn {#1}
1011   {
1012     { non-ltcmd } { Command-is-not-a-valid-ltcmd-command. }
1013     { unknown-type } { Found-an-unknown-argument-type. }
1014     { invalid-end }
1015     { Target-command-is-not-named-\iow_char:N \end<name>. }
1016   }
1017 }

```

And, of course, add `\__kernel_cmd_if_xparse:NTF` and `\__cmd_copy:NN` to `\@declarecommandcopylisthook`:

```

1018 \tl_gput_right:Nn \@declarecommandcopylisthook
1019 { { \__kernel_cmd_if_xparse:NTF \__cmd_copy:NN } }

```

(End definition for `\__cmd_copy:NN`, `\__cmd_set_eq_if_exist:NN`, and `\__cmd_cant_copy:nwn`.)

`\__cmd_copy_command:nnNN` A normal (non-expandable) command has a pretty straightforward structure. Its definition is stored in `\<cmd>_code`, its defaults (if any) are stored in `\<cmd>_defaults`, and its top-level definition contains its signature, which can just be copied over. `\__cmd_copy_command:nnNN` copies the command code and defaults, and then defines the top-level command using the auxiliary `\__cmd_copy_command:NnNNnnnn`. This macro takes the signature of the command being copied from its top-level definition, and replaces the named bits with the new name.

```

1020 \cs_new_protected:Npn \__cmd_copy_command:nnNN #1 #2 #3 #4
1021 {
1022   \cs_set_eq:cc { #1 ~ code } { #2 ~ code }
1023   \__cmd_set_eq_if_exist:cc { #1 ~ defaults } { #2 ~ defaults }
1024   \cs_set_protected_nopar:Npx #3
1025   { \exp_after:wN \__cmd_copy_command:NnNNnnnn #4 {#1} }
1026 }
1027 \cs_new:Npn \__cmd_copy_command:NnNNnnnn #1 #2 #3 #4 #5 #6 #7 #8
1028 {
1029   #1 \exp_not:n { {#2} }
1030   \exp_not:c { #8 ~ } \exp_not:c { #8 ~ code }
1031   \exp_not:n { {#5} {#6} {#7} }
1032 }

```

(End definition for `\__cmd_copy_command:nnNN` and `\__cmd_copy_command:NnNNnnnn`.)

`\__cmd_copy_expandable:nnNN` An expandable command is slightly more complicated. Besides the `\<cmd>_code`, and `\<cmd>_defaults`, it also has an auxiliary `\<cmd>_` for grabbing delimited arguments, and possibly another auxiliary `\<cmd>_`, if the command has both long and short arguments. Then, its signature also has several specific bits that are unique to that command; this is in contrast to non-expandable commands, which use a common set of parsing functions.

We start by copying the basics, then call `\__cmd_copy_expandable_signature:NnNNNNnnnn` to parse the signature of the command and build up the modified copy in a temporary token list, then we call `\__cmd_copy_expandable:NnNNNNnnnn` that will copy the top-level definition of the command, with the proper internal renames.

```

1033 \cs_new_protected:Npn \__cmd_copy_expandable:nnNN #1 #2 #3 #4
1034 {
1035   \cs_set_eq:cc { #1 ~ code } { #2 ~ code }

```

```

1036 \__cmd_set_eq_if_exist:cc { #1 ~ } { #2 ~ }
1037 \__cmd_set_eq_if_exist:cc { #1 ~ \c_space_tl } { #2 ~ \c_space_tl }
1038 \__cmd_set_eq_if_exist:cc { #1 ~ defaults } { #2 ~ defaults }
1039 \exp_after:wN \__cmd_copy_expandable_signature:NnNNNNnnn #4 {#1} {#2}
1040 \cs_set_nopar:Npx #3
1041 { \exp_after:wN \__cmd_copy_expandable:NnNNNNnnn #4 {#1} {#2} }
1042 }
1043 \cs_new:Npn \__cmd_copy_expandable:NnNNNNnnn #1 #2 #3 #4 #5 #6 #7 #8 #9
1044 {
1045 \exp_not:N #1 \exp_not:n { {#2} }
1046 \exp_not:c { #8 ~ }
1047 \exp_not:c
1048 {
1049 #8 ~
1050 \str_if_eq:eeT
1051 { \exp_not:c { #9 ~ \c_space_tl } } { \exp_not:N #4 }
1052 { \c_space_tl }
1053 }
1054 \exp_not:c { #8 ~ code }
1055 \str_if_eq:eeTF { \exp_not:N #6 } { ? }
1056 { ? }
1057 { \exp_not:c { #8 ~ defaults } }
1058 { \exp_not:V \l__cmd_tmpa_tl }
1059 }

```

A signature for an expandable command contains as many `\expandable_grab_⟨type⟩:w` as there are arguments, and what follows this macro depends on the `⟨type⟩`. We'll start a loop through the signature, and at each argument grabber, we'll step the argument count, and look for the `⟨type⟩` with `\__cmd_copy_parse_grabber:w` so that we know which `\__cmd_copy_grabber_⟨type⟩:w` to call next.

```

1060 \cs_new_protected:Npn \__cmd_copy_expandable_signature:NnNNNNnnn
1061 #1 #2 #3 #4 #5 #6 #7 #8 #9
1062 {
1063 \int_zero:N \l__cmd_current_arg_int
1064 \tl_clear:N \l__cmd_tmpa_tl
1065 \__cmd_copy_expandable:nnN {#8} {#9} #7
1066 \q_recursion_tail \q_recursion_stop
1067 }
1068 \cs_new_protected:Npn \__cmd_copy_expandable:nnN #1 #2 #3
1069 {
1070 \quark_if_recursion_tail_stop:n {#3}
1071 \int_incr:N \l__cmd_current_arg_int
1072 \exp_after:wN \__cmd_copy_parse_grabber:w \token_to_str:N #3 {#1} {#2}
1073 }
1074 \use:x
1075 {
1076 \cs_new_protected:Npn \exp_not:N \__cmd_copy_parse_grabber:w ##1
1077 \tl_to_str:n { expandable_grab_ } ##2 \tl_to_str:n { :w }
1078 {
1079 \tl_put_right:Nx \exp_not:N \l__cmd_tmpa_tl
1080 { \exp_not:N \exp_not:c { __cmd_expandable_grab_##2:w } }
1081 \exp_not:N \cs_if_exist_use:cF { __cmd_copy_grabber_##2:w }
1082 { \__cmd_cant_copy:nwn { unknown-type } }
1083 }

```

1084 }

The most complicated is the Delimited argument: each argument has a dedicated grabbing function named after the command that has to be copied over (of the form  $\backslash\langle cmd\rangle_{\langle num\rangle}$ ).

```

1085 \cs_new_protected:Npn \__cmd_copy_grabber_D:w #1 #2 #3 #4 #5
1086 {
    \tl_put_right:Nx \l__cmd_tmpa_tl
1087 {
1088     \exp_not:c { #1 ~ (arg ~ \int_use:N \l__cmd_current_arg_int ) }
1089     \exp_not:n { #4 #5 }
1090 }
1091 \cs_set_eq:cc
1092 { #1 ~ (arg ~ \int_use:N \l__cmd_current_arg_int ) }
1093 { #2 ~ (arg ~ \int_use:N \l__cmd_current_arg_int ) }
1094 \__cmd_copy_expandable:nnN {#1} {#2}
1095 }
1096 
```

D<sub>alt</sub> is just a special case of D that uses a single delimiter (used when both delimiters of the argument are identical):

```

1097 \cs_new_protected:Npn \__cmd_copy_grabber_D_alt:w #1 #2 #3 #4
1098 { \__cmd_copy_grabber_D:w {#1} {#2} {#3} {#4} { } }

```

As far as copying is concerned, R is identical to D:

```

1099 \cs_new_eq:NN \__cmd_copy_grabber_R:w \__cmd_copy_grabber_D:w
1100 \cs_new_eq:NN \__cmd_copy_grabber_R_alt:w \__cmd_copy_grabber_D_alt:w

```

E is straightforward: we just copy the embellishments over, and increase the current argument number  $\backslash\l__cmd\_current\_arg\_int$  by the number of embellishments (minus one because there is a  $\backslash\int\_incr:N$  down the line).

```

1101 \cs_new_protected:Npn \__cmd_copy_grabber_E:w #1 #2 #3 #4
1102 {
1103     \tl_put_right:Nn \l__cmd_tmpa_tl { {#3} {#4} }
1104     \int_add:Nn \l__cmd_current_arg_int { \tl_count:n {#4} - 1 }
1105     \__cmd_copy_expandable:nnN {#1} {#2}
1106 }
1107 \cs_new_eq:NN \__cmd_copy_grabber_E_long:w \__cmd_copy_grabber_E:w

```

t just needs copying the token to be tested for:

```

1108 \cs_new_protected:Npn \__cmd_copy_grabber_t:w #1 #2 #3 #4
1109 {
1110     \tl_put_right:Nn \l__cmd_tmpa_tl { #3 #4 }
1111     \__cmd_copy_expandable:nnN {#1} {#2}
1112 }

```

And last but not least, m is the simplest; the grabber is just  $\backslash\__cmd\_expandable\_grab\_m:w$ , which is already added to the new command so here we just resume the loop:

```

1113 \cs_new_protected:Npn \__cmd_copy_grabber_m:w { \__cmd_copy_expandable:nnN }
1114 \cs_new_eq:NN \__cmd_copy_grabber_m_long:w \__cmd_copy_grabber_m:w

```

(End definition for  $\backslash\__cmd\_copy\_expandable:nnNN$  and others.)

Copying an environment's  $\backslash\begin$  part is pretty much like copying a command, except it has a longer name, and at the end we have to copy  $\backslash\environment\langle name\rangle$  into  $\backslash\langle name\rangle$ .

```

1115 \cs_new_protected:Npn \__cmd_copy_environment:nnNN #1 #2 #3 #4

```

```

1116 {
1117   \cs_set_eq:cc { environment~ #1 ~ code } { environment~ #2 ~ code }
1118   \__cmd_set_eq_if_exist:cc
1119     { environment~ #1 ~ defaults } { environment~ #2 ~ defaults }
1120   \cs_set_protected_nopar:cpx { environment~ #1 }
1121     { \exp_after:wN \__cmd_copy_environment:Nnnnnnn #4 {#1} }
1122   \cs_set_eq:cc {#1} { environment~ #1 }
1123 }
1124 \cs_new:Npn \__cmd_copy_environment:Nnnnnnn #1 #2 #3 #4 #5 #6 #7
1125 { #1 \exp_not:n { {#2} } {#7} \exp_not:n { {#4} {#5} {#6} } }

```

(End definition for \\_\_cmd\_copy\_environment:nnNN and \\_\_cmd\_copy\_environment:Nnnnnnn.)

\\_\_cmd\_copy\_environment\_end:nnNN  
 \\_\_cmd\_copy\_environment\_end\_aux:nnNN

Copying an environment's \end part is a bit trickier. We first have to make sure that both parts are named \end<name> (that's actually not a hard requirement, but an environment \end command makes no sense without the end in its name), and strip the leading end from the strings. After that, copying is straightforward.

```

1126 \cs_new_protected:Npn \__cmd_copy_environment_end:nnNN #1 #2
1127 {
1128   \__cmd_check_end:Nn \l__cmd_tmpa_tl {#1}
1129   \__cmd_check_end:Nn \l__cmd_tmpb_tl {#2}
1130   \exp_args:Noo \__cmd_copy_environment_end_aux:nnNN
1131     { \l__cmd_tmpa_tl } { \l__cmd_tmpb_tl }
1132 }
1133 \cs_new_protected:Npn \__cmd_copy_environment_end_aux:nnNN #1 #2 #3 #4
1134 {
1135   \cs_set_nopar:cpx { environment~ #1 ~end }
1136     { \exp_not:c { environment~ #1 ~end~aux } }
1137   \cs_set_eq:cc
1138     { environment~ #1 ~end~aux~ } { environment~ #2 ~end~aux~ }
1139   \cs_set_eq:cc { end #1 } { environment~ #1 ~end }
1140 }

```

To check whether an \end command is valid, we look for the string end at the beginning of the command name, and if not found, raise an error:

\\_\_cmd\_check\_end:Nn  
 \\_\_cmd\_check\_end:n  
 \\_\_cmd\_check\_end:w

```

1141 \cs_new_protected:Npn \__cmd_check_end:Nn #1 #2
1142 {
1143   \tl_set:Nx #1 { \__cmd_check_end:n {#2} }
1144   \token_if_eq_meaning:NNT #1 \q_nil
1145     { \__cmd_cant_copy:nwn { invalid-end } }
1146 }
1147 \cs_set_protected:Npn \__cmd_tmp:w #1
1148 {
1149   \cs_new:Npn \__cmd_check_end:n ##1
1150   {
1151     \exp_after:wN \__cmd_check_end:w \tl_to_str:n {##1}
1152     #1 \q_mark #1 \q_stop
1153   }
1154   \cs_new:Npn \__cmd_check_end:w ##1 #1 ##2 #1 ##3 \q_stop
1155     { \if_meaning:w ##2 \q_mark \exp_not:N \q_nil \else: ##2 \fi: }
1156 }
1157 \exp_args:No \__cmd_tmp:w { \tl_to_str:n { end } }

```

(End definition for `\_cmd_copy_environment_end:n` and others.)

Not much to do regarding `latexrelease`: we could remove the entries from `\@declarecommandcopylist` but it doesn't seem worth it.

```
1158 \latexrelease\EndIncludeInRelease
1159 \latexrelease\IncludeInRelease{2020/10/01}{\_cmd_copy:NN}%
1160 \latexrelease{Support~\NewCommandCopy~in~ltxcmd}
1161 \latexrelease\EndIncludeInRelease
```

## 1.7.2 Showing the definition of a command

```
1162 \latexrelease\IncludeInRelease{2021/11/15}{\_cmd_show:N}%
1163 \latexrelease{Support~\ShowCommand~in~ltxcmd}
```

To show the definition of a command we need more or less the same building blocks as for copying, except that instead of making a copy, we'll just print stuff to the terminal. This macro just branches to the proper showing command by using `\_cmd_cmd_type_cases:NnnnnF`. The showing command takes the command to be shown as argument.

`\_cmd_show:N`

```
1164 \cs_new_protected:Npn \_cmd_show:N #1
1165 {
1166   \use:x
1167   {
1168     \int_set:Nn \tex_escapechar:D { 92 }
1169     \exp_not:N \_cmd_cmd_type_cases:NnnnnF \exp_not:N #1
1170     { \_cmd_show_command:N }
1171     { \_cmd_show_expandable:N }
1172     { \_cmd_show_environment:N }
1173     { \_cmd_show_environment_end:N }
1174     { \_cmd_cant_copy:nwn { non-ltxcmd } }
1175     \exp_not:N #1
1176     \exp_not:N \_cmd_break_point:n { \cs_to_str:N #1 }
1177     \int_set:Nn \tex_escapechar:D { \int_use:N \tex_escapechar:D }
1178   }
1179 }
```

(End definition for `\_cmd_show:N`.)

`\_cmd_show_command:N`  
`\_cmd_show_command:NnnNwN`  
`\_cmd_show_expandable:N`  
`\_cmd_show_expandable:NnnNNnN`  
`\_cmd_show_command_aux:nNNn`  
`\_cmd_show_environment:N`

These commands just expand the command once to reveal its innards, then pass the type of command, the control sequence, the signature, and the code macro to `\_cmd_show_command_aux:nNNn`.

```
1180 \cs_new_protected:Npn \_cmd_show_command:N #1
1181 { \exp_after:wN \_cmd_show_command:NnnNwN #1 \q__cmd #1 }
1182 \cs_new_protected:Npn \_cmd_show_command:NnnNwN #1 #2 #3 #4 #5 \q__cmd #6
1183 { \_cmd_show_command_aux:nNNn { document~command } #6 #4 {#2} }
1184 \cs_new_protected:Npn \_cmd_show_expandable:N #1
1185 { \exp_after:wN \_cmd_show_expandable:NnnNNNnN #1 #1 }
1186 \cs_new_protected:Npn \_cmd_show_expandable:NnnNNNnN #1 #2 #3 #4 #5 #6 #7 #8
1187 { \_cmd_show_command_aux:nNNn { expandable~document~command } #8 #5 {#2} }
```

Now just print everything in the required format. The auxiliary `\_cmd_split_signature:n` stores a ready-to-print token list in `\l__cmd_tmpa_tl`, so we just use that here:

```
1188 \cs_new_protected:Npn \_cmd_show_command_aux:nNNn #1 #2 #3 #4
1189 {
1190   \_cmd_split_signature:n {#4}
```

```

1191 \tl_show:x
1192 {
1193   \token_to_str:N #2 = #1: \iow_newline:
1194   \tl_use:N \l__cmd_tmpa_tl
1195   -> \cs_replacement_spec:N #3
1196 }
1197 }

```

We can reuse most of the above to show an environment, except that we need to ensure that the proper `\environment ...` are passed to `\__cmd_show_command_aux:nNNn`. Additionally, when `\ShowCommand\foo` is used (if `foo` is an environment), we show `\endfoo` as well, and when `\ShowCommand\endfoo` is used, change that to `\ShowCommand\foo` and do the same.

```

1198 \cs_new_protected:Npn \__cmd_show_environment:N #1
1199 {
1200   \exp_after:wN \__cmd_show_environment:Nnnw #1 \q__cmd
1201   \tl_show:x
1202   {
1203     \token_to_str:N \end { \cs_to_str:N #1 } : \iow_newline:
1204     -> \exp_args:Nc \cs_replacement_spec:N
1205       { environment~ \cs_to_str:N #1 ~end~aux~ }
1206   }
1207 }
1208 \cs_new_protected:Npn \__cmd_show_environment:Nnnw #1 #2 #3 #4 \q__cmd
1209 {
1210   \use:x
1211   {
1212     \__cmd_show_command_aux:nNNn { document~environment }
1213     { \exp_not:N \begin {#3} }
1214     \exp_not:c { environment~ #3 ~ code }
1215     {#2}
1216   }
1217 }
1218 \cs_new_protected:Npn \__cmd_show_environment_end:N #1
1219 {
1220   \exp_args:NNx \__cmd_check_end:Nn \l__cmd_tmpa_tl { \cs_to_str:N #1 }
1221   \exp_args:Nc \__cmd_show_environment:N { \l__cmd_tmpa_tl }
1222 }

```

And, of course, add `\__kernel_cmd_if_xparse:NTF` and `\__cmd_show:N` to `\@showcommandlisthook`

```

1223 \tl_gput_right:Nn \@showcommandlisthook
1224 { { \__kernel_cmd_if_xparse:NTF \__cmd_show:N } }

```

(End definition for `\__cmd_show_command:N` and others.)

`\__cmd_split_signature:n` Now we'll try a least-effort adventure into splitting the symbolic user-provided signature for a command into individual parameters for pretty-printing. A counter is used to keep track of the current argument number, and two token lists are used: `\l__cmd_tmpa_tl` holds the final token list to be printed, and `\l__cmd_tmpb_tl` holds just the current item, so that we can make changes to an individual item without having to dissect the whole thing (this is used for `e-` and `E-`types).

```

1225 \cs_new_protected:Npn \__cmd_split_signature:n #1
1226 {
1227   \int_set:Nn \l__cmd_current_arg_int { 1 }

```

```

1228 \tl_clear:N \l__cmd_tmpa_tl
1229 \tl_clear:N \l__cmd_tmpb_tl
1230 \__cmd_split_signature_loop:Nw #1 \q_recursion_tail \q_recursion_stop
1231 }

```

This is the main chunk of the loop: it starts an item with `\__cmd_split_start_item:` (this adds indentation and the argument number to `\l__cmd_tmpb_tl`), then checks if a special token list `\c__cmd_show_type_⟨type⟩_tl` exists. If it doesn't, the current argument is a “simple” type which needs no extra processing. Otherwise, call a specific function depending on the value of said token list.

```

1232 \cs_new_protected:Npn \__cmd_split_signature_loop:Nw #1
1233 {
1234   \quark_if_recursion_tail_stop:N #1
1235   \tl_if_empty:NT \l__cmd_tmpb_tl { \__cmd_split_start_item: }
1236   \tl_if_exist:cTF { c__cmd_show_type_#1_tl }
1237   {
1238     \use:c
1239     {
1240       __cmd_show_
1241       \if_case:w \tl_use:c { c__cmd_show_type_#1_tl } \exp_stop_f:
1242       delim \or: delims \or: delims_opt \or: opt \or:
1243       e \or: E \or: prefix \or: processor \fi: :Nw
1244     } #1
1245   }
1246   { \__cmd_split_end_item:n {#1} \__cmd_split_signature_loop:Nw }
1247 }

```

The token lists `\c__cmd_show_type_⟨type⟩_tl` exist for nontrivial (for printing) *⟨types⟩* that require special parsing (like delimiters or optional arguments). Values from 0 to 7 are assigned to each type:

```

\c__cmd_show_type_t_tl
\c__cmd_show_type_r_tl
\c__cmd_show_type_d_tl
\c__cmd_show_type_R_tl
\c__cmd_show_type_D_tl
\c__cmd_show_type_0_tl
\c__cmd_show_type_e_tl
\c__cmd_show_type_E_tl
\c__cmd_show_type+_tl
\c__cmd_show_type!_tl
\c__cmd_show_type>_tl

```

1. a single delimiter token;
2. two delimiter tokens;
3. two delimiter tokens plus a default value;
4. a default value;
5. a list of embellishments (exclusive for `e`-type);
6. embellishments plus defaults (exclusive for `E`-type);
7. simple prefixes;
8. prefixes with arguments (argument processors);

```

1248 \cs_set_protected:Npn \__cmd_tmp:w #1 #2
1249 {
1250   \quark_if_nil:nF {#1}
1251   { \tl_const:cn { c__cmd_show_type_#1_tl } {#2} \__cmd_tmp:w }
1252 }
1253 \__cmd_tmp:w t0 r1 d1 R2 D2 O3 e4 E5 +6 !6 >7 \q_nil \q_nil

```



Now, based on each type we know how to act. In most cases it is just a matter of feeding in the grabbed arguments and resuming the loop. The embellishments require a bit more attention: the `e`-type loops through the list of embellishments and adds each to the token list as a separate argument. The `E`-type does more or less the same, but uses `\__cmd_tl_mapthread_function:nnN` to map over two lists simultaneously, adding each token and default to the token list for printing.

```

1254 \cs_new_protected:Npn \__cmd_show_delim:Nw #1 #2
1255   { \__cmd_split_end_item:n { #1 #2 } \__cmd_split_signature_loop:Nw }
1256 \cs_new_protected:Npn \__cmd_show_delims:Nw #1 #2 #3
1257   { \__cmd_split_end_item:n { #1 #2 #3 } \__cmd_split_signature_loop:Nw }
1258 \cs_new_protected:Npn \__cmd_show_delims_opt:Nw #1 #2 #3 #4
1259   { \__cmd_split_end_item:n { #1 #2 #3 {#4} } \__cmd_split_signature_loop:Nw }
1260 \cs_new_protected:Npn \__cmd_show_opt:Nw #1 #2
1261   { \__cmd_split_end_item:n { #1 {#2} } \__cmd_split_signature_loop:Nw }
1262 \cs_new_protected:Npn \__cmd_show_e:Nw #1 #2
1263   {
1264     \tl_map_inline:nn {#2}
1265     {
1266       \__cmd_split_start_item:
1267       \__cmd_split_end_item:n { #1 ##1 }
1268     }
1269     \__cmd_split_signature_loop:Nw
1270   }
1271 \cs_set_protected:Npn \__cmd_tmp:w #1
1272   {
1273     \cs_new_protected:Npn \__cmd_show_E:Nw ##1 ##2 ##3
1274     {
1275       \cs_set_protected:Npn \__cmd_tmp:w #####1 #####2
1276       {
1277         \__cmd_split_start_item:
1278         \__cmd_split_end_item:n { ##1 #####1 {#####2} }
1279       }
1280       \__cmd_tl_mapthread_function:nnN {##2}
1281       { ##3 {#1} {#1} {#1} {#1} {#1} {#1} {#1} {#1} {#1} } \__cmd_tmp:w
1282       \__cmd_split_signature_loop:Nw
1283     }
1284   }
1285 \exp_args:NV \__cmd_tmp:w \c_novalue_tl

```

Minor wrinkle with the prefixes: they use `\__cmd_split_add_item:n` instead of `\__cmd_split_end_item:n` (add *vs.* end) because they are followed by an argument, so they can't end the item.

```

1286 \cs_new_protected:Npn \__cmd_show_prefix:Nw #1
1287   { \__cmd_split_add_item:n {#1} \__cmd_split_signature_loop:Nw }
1288 \cs_new_protected:Npn \__cmd_show_processor:Nw #1 #2
1289   { \__cmd_split_add_item:n { #1 {#2} } \__cmd_split_signature_loop:Nw }

```

And now the auxiliaries that store the strings to be printed. `\__cmd_split_start_item:` starts an item from scratch, `\__cmd_split_add_item:n` adds tokens to an item without adding a newline, and `\__cmd_split_end_item:n` adds tokens, terminates the item with a newline, and steps the argument count.

```

1290 \cs_new_protected:Npn \__cmd_split_start_item:
1291   {

```

```

1292 \tl_set:Nx \l__cmd_tmppb_tl
1293 { ~ \c_space_tl \c_hash_str \int_use:N \l__cmd_current_arg_int : }
1294 }
1295 \cs_new_protected:Npn \__cmd_split_add_item:n #1
1296 { \tl_put_right:Nx \l__cmd_tmppb_tl { \tl_to_str:n {#1} } }
1297 \cs_new_protected:Npn \__cmd_split_end_item:n #1
1298 {
1299 \tl_put_right:Nx \l__cmd_tmppa_tl
1300 { \l__cmd_tmppb_tl \tl_to_str:n {#1} \iow_newline: }
1301 \tl_clear:N \l__cmd_tmppb_tl
1302 \int_incr:N \l__cmd_current_arg_int
1303 }

```

(End definition for `\__cmd_split_signature:n` and others.)

Not much to do regarding `latexrelease`: we could remove the entries from `\@showcommandlisthook`, but it doesn't seem worth it.

```

1304 <latexrelease>\EndIncludeInRelease
1305 %
1306 <latexrelease>\IncludeInRelease{2020/10/01}{\__cmd_show:N}%
1307 <latexrelease> {Support~\ShowCommand~in~ltxcmd}
1308 <latexrelease>\EndIncludeInRelease

```

## 1.8 Grabbing arguments

All of the grabbers follow the same basic pattern. The initial function stores in `\l__cmd_signature_tl` the code to grab further arguments, defines (the function in) `\l__cmd_fn_tl` that will grab the argument, and calls it.

Defining `\l__cmd_fn_tl` means determining whether to use `\cs_set:Npn` or `\cs_set_nopar:Npn`, and for optional arguments whether to skip spaces. Once the argument is found, `\l__cmd_fn_tl` calls `\__cmd_add_arg:n`, responsible for calling processors and grabbing further arguments.

```

\__cmd_grab_b:w
\__cmd_grab_b_long:w
\__cmd_grab_b_obey_spaces:w
\__cmd_grab_b_long_obey_spaces:w
\__cmd_grab_b_aux:NNw
\__cmd_grab_b_end:Nw

```

This uses the well-tested code of D-type arguments, skipping the peeking step because the b-type argument is always present, and adding a cleanup stage at the end by hijacking the signature. The clean-up consists of properly dealing with `\l__cmd_args_tl` and also putting back the `\end` that served as an end-delimiter: this `\end` receives the environment name as its argument and is run normally. The D-type code stores the argument found (body of the environment) as a brace group in `\l__cmd_args_tl` and depending on the presence of a prefix `!` we trim spaces or not before adding this braced argument into the saved `\l__cmd_args_tl`. The strange `\begin_` control sequence is there for display purposes only: it has to look like `\begin` in the terminal but not to delimited arguments.

```

1309 \cs_new_protected:Npn \__cmd_grab_b:w
1310 { \__cmd_grab_b_aux:NNw \cs_set_protected_nopar:Npn \tl_trim_spaces:n }
1311 \cs_new_protected:Npn \__cmd_grab_b_long:w
1312 { \__cmd_grab_b_aux:NNw \cs_set_protected:Npn \tl_trim_spaces:n }
1313 \cs_new_protected:Npn \__cmd_grab_b_obey_spaces:w
1314 { \__cmd_grab_b_aux:NNw \cs_set_protected_nopar:Npn \exp_not:n }
1315 \cs_new_protected:Npn \__cmd_grab_b_long_obey_spaces:w
1316 { \__cmd_grab_b_aux:NNw \cs_set_protected:Npn \exp_not:n }
1317 \cs_new_protected:Npn \__cmd_grab_b_aux:NNw #1#2#3 \__cmd_run_code:
1318 {
1319 \__cmd_grab_D_aux:NNnN \begin \end {#3} #1

```

```

1320 \tl_put_left:Nn \l__cmd_signature_tl { \__cmd_grab_b_end:Nw #2 }
1321 \tl_set_eq:NN \l__cmd_saved_args_tl \l__cmd_args_tl
1322 \tl_clear:N \l__cmd_args_tl
1323 \exp_args:Nc \l__cmd_fn_tl { begin ~ }
1324 }
1325 \cs_new_protected:Npn \__cmd_grab_b_end:Nw #1#2 \__cmd_run_code:
1326 {
1327   \tl_set:Nx \l__cmd_args_tl
1328   {
1329     \exp_not:V \l__cmd_saved_args_tl
1330     { \exp_after:wN #1 \l__cmd_args_tl }
1331   }
1332   #2
1333   \__cmd_run_code:
1334   \end
1335 }

```

(End definition for \\_\_cmd\_grab\_b:w and others.)

\\_\_cmd\_grab\_D:w The generic delimited argument grabber. The auxiliary function does a peek test before calling \\_\_cmd\_grab\_D\_call:Nw, so that the optional nature of the argument works as expected.

```

\__cmd_grab_D_long:w
\__cmd_grab_D_obey_spaces:w
\__cmd_grab_D_long_obey_spaces:w
1336 \cs_new_protected:Npn \__cmd_grab_D:w #1#2#3 \__cmd_run_code:
1337 {
1338   \__cmd_grab_D_aux:NNnNN #1 #2 {#3} \cs_set_protected_nopar:Npn
1339   \__cmd_peek_nonspace_remove:NTF
1340 }
1341 \cs_new_protected:Npn \__cmd_grab_D_long:w #1#2#3 \__cmd_run_code:
1342 {
1343   \__cmd_grab_D_aux:NNnNN #1 #2 {#3} \cs_set_protected:Npn
1344   \__cmd_peek_nonspace_remove:NTF
1345 }
1346 \cs_new_protected:Npn \__cmd_grab_D_obey_spaces:w #1#2#3 \__cmd_run_code:
1347 {
1348   \__cmd_grab_D_aux:NNnNN #1 #2 {#3} \cs_set_protected_nopar:Npn
1349   \__cmd_peek_meaning_remove:NTF
1350 }
1351 \cs_new_protected:Npn \__cmd_grab_D_long_obey_spaces:w #1#2#3 \__cmd_run_code:
1352 {
1353   \__cmd_grab_D_aux:NNnNN #1 #2 {#3} \cs_set_protected:Npn
1354   \__cmd_peek_meaning_remove:NTF
1355 }

```

This is a bit complicated. The idea is that, in order to check for nested optional argument tokens ([...] and so on) the argument needs to be grabbed without removing any braces at all. If this is not done, then cases like [{[]}] fail. So after testing for an optional argument, it is collected piece-wise. Inserting a quark prevents loss of braces, and there is then a test to see if there are nested delimiters to handle.

```

\__cmd_grab_D_aux:NNnNN
\__cmd_grab_D_aux:NNnN
1356 \cs_new_protected:Npn \__cmd_grab_D_aux:NNnNN #1#2#3#4#5
1357 {
1358   \__cmd_grab_D_aux:NNnN #1#2 {#3} #4
1359   #5 #1
1360   { \__cmd_grab_D_call:Nw #1 }
1361   { \__cmd_add_arg:o \c_novalue_tl }

```

1362 }

Inside the “standard” grabber, there is a test to see if the grabbed argument is entirely enclosed by braces. There are a couple of extra factors to allow for: the argument might be entirely empty, and spaces at the start and end of the input must be retained around a brace group. Also notice that a *blank* argument might still contain spaces.

```

1363 \cs_new_protected:Npn \__cmd_grab_D_aux:NNnN #1#2#3#4
1364 {
1365   \tl_set:Nn \l__cmd_signature_tl {#3}
1366   \exp_after:wN #4 \l__cmd_fn_tl ##1 #2
1367   {
1368     \tl_if_in:nnTF {##1} {#1}
1369     { \__cmd_grab_D_nested:NNnN #1 #2 {##1} #4 }
1370     {
1371       \tl_if_blank:oTF { \use_none:n ##1 }
1372       { \__cmd_add_arg:o { \use_none:n ##1 } }
1373       {
1374         \str_if_eq:eeTF
1375         { \exp_not:o { \use_none:n ##1 } }
1376         { { \exp_not:o { \use_ii:nnn ##1 \q_nil } } }
1377         { \__cmd_add_arg:o { \use_ii:nn ##1 } }
1378         { \__cmd_add_arg:o { \use_none:n ##1 } }
1379       }
1380     }
1381   }
1382 }
```

(End definition for \\_\_cmd\_grab\_D:w and others.)

```

\__cmd_grab_D_nested:NNnN
\__cmd_grab_D_nested:w
\l__cmd_nesting_a_tl
\l__cmd_nesting_b_tl
\q__cmd
```

Catching nested optional arguments means more work. The aim here is to collect up each pair of optional tokens without TeX helping out, and without counting anything. The code above will already have removed the leading opening token and a closing token, but the wrong one. The aim is then to work through the material grabbed so far and divide it up on each opening token, grabbing a closing token to match (thus working in pairs). Once there are no opening tokens, then there is a second check to see if there are any opening tokens in the second part of the argument (for things like `[] []`). Once everything has been found, the entire collected material is added to the output as a single argument. The only tricky part here is ensuring that any grabbing function that might run away is named after the function currently being parsed and not after `xparse`. That leads to some rather complex nesting! There is also a need to prevent the loss of any braces, hence the insertion and removal of quarks along the way.

```

1383 \tl_new:N \l__cmd_nesting_a_tl
1384 \tl_new:N \l__cmd_nesting_b_tl
1385 \quark_new:N \q__cmd
1386 \cs_new_protected:Npn \__cmd_grab_D_nested:NNnN #1#2#3#4
1387 {
1388   \tl_clear:N \l__cmd_nesting_a_tl
1389   \tl_clear:N \l__cmd_nesting_b_tl
1390   \exp_after:wN #4 \l__cmd_fn_tl ##1 #1 ##2 \q__cmd ##3 #2
1391   {
1392     \tl_put_right:No \l__cmd_nesting_a_tl { \use_none:n ##1 #1 }
1393     \tl_put_right:No \l__cmd_nesting_b_tl { \use_i:nn #2 ##3 }
1394     \tl_if_in:nnTF {##2} {#1}
```

```

1395     {
1396       \l__cmd_fn_tl
1397       \q_nil ##2 \q__cmd \ERROR
1398     }
1399     {
1400       \tl_put_right:Nx \l__cmd_nesting_a_tl
1401       { \__cmd_grab_D_nested:w \q_nil ##2 \q_stop }
1402       \tl_if_in:NnTF \l__cmd_nesting_b_tl {#1}
1403       {
1404         \tl_set_eq:NN \l__cmd_tmpa_tl \l__cmd_nesting_b_tl
1405         \tl_clear:N \l__cmd_nesting_b_tl
1406         \exp_after:wN \l__cmd_fn_tl \exp_after:wN
1407         \q_nil \l__cmd_tmpa_tl \q_nil \q__cmd \ERROR
1408       }
1409       {
1410         \tl_put_right:No \l__cmd_nesting_a_tl
1411         \l__cmd_nesting_b_tl
1412         \__cmd_add_arg:V \l__cmd_nesting_a_tl
1413       }
1414     }
1415   }
1416   \l__cmd_fn_tl #3 \q_nil \q__cmd \ERROR
1417 }
1418 \cs_new:Npn \__cmd_grab_D_nested:w #1 \q_nil \q_stop
1419 { \exp_not:o { \use_none:n #1 } }

```

(End definition for `\__cmd_grab_D_nested:NnN` and others.)

`\__cmd_grab_D_call:Nw` For D and R-type arguments, to avoid losing any braces, a token needs to be inserted before the argument to be grabbed. If the argument runs away because the closing token is missing then this inserted token shows up in the terminal. Ideally, `#1` would therefore be used directly, but that is no good as it will mess up the rest of the grabber. Instead, a copy of `#1` with an altered category code is used, as this will look right in the terminal but will not mess up the grabber. The only issue then is that the category code of `#1` is unknown. So there is a quick test to ensure that the inserted token can never be matched by the grabber. (This assumes that the open and close delimiters are not the same character with different category codes, but that really should not happen in any sensible document-level syntax.) An exception is when `#1` is a control sequence token, in which case the character-token treatment is no good because if hit with `\token_to_str:N` it would add sputios tokens to the argument. In this case a different branch is taken. The token inserted is then the same  $\langle csname \rangle$  as `#1`, but with a space appended, so that the grabber don't see it as another of the same delimiter.

```

1420 \cs_new_protected_nopar:Npn \__cmd_grab_D_call:Nw #1
1421 {
1422   \token_if_eq_catcode:NNTF + #1
1423   {
1424     \exp_after:wN \exp_after:wN \exp_after:wN
1425     \l__cmd_fn_tl \char_generate:nn { ' #1 } { 11 }
1426   }
1427   {
1428     \__cmd_token_if_cs:NNTF #1
1429     {
1430       \exp_after:wN \l__cmd_fn_tl

```

```

1431         \cs:w \cs_to_str:N #1 ~ \cs_end:
1432     }
1433     {
1434         \exp_after:wN \l__cmd_fn_tl
1435         \token_to_str:N #1
1436     }
1437 }
1438 }

```

(End definition for \\_\_cmd\_grab\_D\_call:Nw.)

\\_\_cmd\_grab\_E:w Everything here needs to point to a loop.

```

\__cmd_grab_E_long:w
\__cmd_grab_E_obey_spaces:w
\__cmd_grab_E_long_obey_spaces:w
\__cmd_grab_E:nnNN
\__cmd_grab_E_loop:NnN
\__cmd_grab_E_finalise:
1439 \cs_new_protected:Npn \__cmd_grab_E:w #1#2 \__cmd_run_code:
1440 {
1441     \__cmd_grab_E:nnNN {#1} {#2}
1442     \cs_set_protected_nopar:Npn
1443     \__cmd_peek_nonspace_remove:NTF
1444 }
1445 \cs_new_protected:Npn \__cmd_grab_E_long:w #1#2 \__cmd_run_code:
1446 {
1447     \__cmd_grab_E:nnNN {#1} {#2}
1448     \cs_set_protected:Npn
1449     \__cmd_peek_nonspace_remove:NTF
1450 }
1451 \cs_new_protected:Npn \__cmd_grab_E_obey_spaces:w #1#2 \__cmd_run_code:
1452 {
1453     \__cmd_grab_E:nnNN {#1} {#2}
1454     \cs_set_protected_nopar:Npn
1455     \__cmd_peek_meaning_remove:NTF
1456 }
1457 \cs_new_protected:Npn \__cmd_grab_E_long_obey_spaces:w #1#2 \__cmd_run_code:
1458 {
1459     \__cmd_grab_E:nnNN {#1} {#2}
1460     \cs_set_protected:Npn
1461     \__cmd_peek_meaning_remove:NTF
1462 }

```

A loop is needed here to allow a random ordering of keys. These are searched for one at a time, with any not found needing to be tracked: they can appear later. The grabbed values are held in a property list which is then turned into an ordered list to be passed back to the user.

```

1463 \cs_new_protected:Npn \__cmd_grab_E:nnNN #1#2#3#4
1464 {
1465     \exp_after:wN #3 \l__cmd_fn_tl ##1##2##3
1466     {
1467         \prop_put:Nnn \l__cmd_tmp_prop {##1} {##3}
1468         \__cmd_grab_E_loop:NnN #4 { } ##2 \q_recursion_stop
1469     }
1470     \prop_clear:N \l__cmd_tmp_prop
1471     \tl_set:Nn \l__cmd_signature_tl {#2}
1472     \cs_set_protected:Npn \__cmd_grab_E_finalise:
1473     {
1474         \tl_map_inline:nn {#1}
1475         {

```

```

1476         \prop_get:NnNF \l__cmd_tmp_prop {###1} \l__cmd_tmpl_tl
1477         { \tl_set_eq:NN \l__cmd_tmpl_tl \c_novalue_tl }
1478         \tl_put_right:Nx \l__cmd_args_tl
1479         { { \exp_not:V \l__cmd_tmpl_tl } }
1480     }
1481     \l__cmd_signature_tl \__cmd_run_code:
1482 }
1483 \__cmd_grab_E_loop:NnN #4 { } #1 \q_recursion_tail \q_recursion_stop
1484 }
1485 \cs_new_protected:Npn \__cmd_grab_E_loop:NnN #1#2#3#4 \q_recursion_stop
1486 {
1487     \cs_if_eq:NNTF #3 \q_recursion_tail
1488     { \__cmd_grab_E_finalise: }
1489     {
1490         #1 #3
1491         { \l__cmd_fn_tl #3 {#2#4} }
1492         { \__cmd_grab_E_loop:NnN #1 {#2#3} #4 \q_recursion_stop }
1493     }
1494 }
1495 \cs_new_protected:Npn \__cmd_grab_E_finalise: { }

```

(End definition for \\_\_cmd\_grab\_E:w and others.)

```

\__cmd_grab_m:w Collecting a single mandatory argument is quite easy.
\__cmd_grab_m_long:w
1496 \cs_new_protected:Npn \__cmd_grab_m:w #1 \__cmd_run_code:
1497 {
1498     \tl_set:Nn \l__cmd_signature_tl {#1}
1499     \exp_after:wN \cs_set_protected_nopar:Npn \l__cmd_fn_tl ##1
1500     { \__cmd_add_arg:n {##1} }
1501     \l__cmd_fn_tl
1502 }
1503 \cs_new_protected:Npn \__cmd_grab_m_long:w #1 \__cmd_run_code:
1504 {
1505     \tl_set:Nn \l__cmd_signature_tl {#1}
1506     \exp_after:wN \cs_set_protected:Npn \l__cmd_fn_tl ##1
1507     { \__cmd_add_arg:n {##1} }
1508     \l__cmd_fn_tl
1509 }

```

(End definition for \\_\_cmd\_grab\_m:w and \\_\_cmd\_grab\_m\_long:w.)

```

\__cmd_grab_m_1:w Grabbing 1–8 mandatory arguments is done by giving 8–1 known arguments to a 9-
\__cmd_grab_m_2:w argument function that stores them in \l__cmd_args_tl. For simplicity, grabbing 9
\__cmd_grab_m_3:w mandatory arguments is done by grabbing 5 then 4 arguments.
\__cmd_grab_m_4:w
1510 \cs_new_protected_nopar:Npn \__cmd_grab_m_aux:Nnnnnnnnn #1#2#3#4#5#6#7#8#9
\__cmd_grab_m_5:w
1511 {
\__cmd_grab_m_6:w     \tl_put_right:No \l__cmd_args_tl
\__cmd_grab_m_7:w     { #1 {#2} {#3} {#4} {#5} {#6} {#7} {#8} {#9} }
\__cmd_grab_m_8:w     \l__cmd_signature_tl \__cmd_run_code:
\__cmd_grab_m_9:w     }
1512
1513 \cs_new_protected:cpn { __cmd_grab_m_1:w } #1 \__cmd_run_code:
1514 {
1515     \tl_set:Nn \l__cmd_signature_tl {#1}
1516     \exp_after:wN \cs_set_eq:NN \l__cmd_fn_tl \__cmd_grab_m_aux:Nnnnnnnnn
1517 }
1518
1519

```

```

1520 \l__cmd_fn_tl \use_none:nnnnnn { } { } { } { } { } { } { }
1521 }
1522 \cs_new_protected:cpn { __cmd_grab_m_2:w } #1 \__cmd_run_code:
1523 {
1524 \tl_set:Nn \l__cmd_signature_tl {#1}
1525 \exp_after:wN \cs_set_eq:NN \l__cmd_fn_tl \__cmd_grab_m_aux:Nnnnnnnnn
1526 \l__cmd_fn_tl \use_none:nnnnnn { } { } { } { } { } { }
1527 }
1528 \cs_new_protected:cpn { __cmd_grab_m_3:w } #1 \__cmd_run_code:
1529 {
1530 \tl_set:Nn \l__cmd_signature_tl {#1}
1531 \exp_after:wN \cs_set_eq:NN \l__cmd_fn_tl \__cmd_grab_m_aux:Nnnnnnnnn
1532 \l__cmd_fn_tl \use_none:nnnnn { } { } { } { } { }
1533 }
1534 \cs_new_protected:cpn { __cmd_grab_m_4:w } #1 \__cmd_run_code:
1535 {
1536 \tl_set:Nn \l__cmd_signature_tl {#1}
1537 \exp_after:wN \cs_set_eq:NN \l__cmd_fn_tl \__cmd_grab_m_aux:Nnnnnnnnn
1538 \l__cmd_fn_tl \use_none:nnnn { } { } { } { }
1539 }
1540 \cs_new_protected:cpn { __cmd_grab_m_5:w } #1 \__cmd_run_code:
1541 {
1542 \tl_set:Nn \l__cmd_signature_tl {#1}
1543 \exp_after:wN \cs_set_eq:NN \l__cmd_fn_tl \__cmd_grab_m_aux:Nnnnnnnnn
1544 \l__cmd_fn_tl \use_none:nnn { } { } { }
1545 }
1546 \cs_new_protected:cpn { __cmd_grab_m_6:w } #1 \__cmd_run_code:
1547 {
1548 \tl_set:Nn \l__cmd_signature_tl {#1}
1549 \exp_after:wN \cs_set_eq:NN \l__cmd_fn_tl \__cmd_grab_m_aux:Nnnnnnnnn
1550 \l__cmd_fn_tl \use_none:nn { } { }
1551 }
1552 \cs_new_protected:cpn { __cmd_grab_m_7:w } #1 \__cmd_run_code:
1553 {
1554 \tl_set:Nn \l__cmd_signature_tl {#1}
1555 \exp_after:wN \cs_set_eq:NN \l__cmd_fn_tl \__cmd_grab_m_aux:Nnnnnnnnn
1556 \l__cmd_fn_tl \use_none:n { }
1557 }
1558 \cs_new_protected:cpn { __cmd_grab_m_8:w } #1 \__cmd_run_code:
1559 {
1560 \tl_set:Nn \l__cmd_signature_tl {#1}
1561 \exp_after:wN \cs_set_eq:NN \l__cmd_fn_tl \__cmd_grab_m_aux:Nnnnnnnnn
1562 \l__cmd_fn_tl \prg_do_nothing:
1563 }
1564 \cs_new_protected:cpx { __cmd_grab_m_9:w }
1565 {
1566 \exp_not:c { __cmd_grab_m_5:w }
1567 \exp_not:c { __cmd_grab_m_4:w }
1568 }

```

(End definition for \\_\_cmd\_grab\_m\_1:w and others.)

\\_\_cmd\_grab\_R:w  
 \\_\_cmd\_grab\_R\_long:w  
 \\_\_cmd\_grab\_R\_aux:NNnN

The grabber for R-type arguments is basically the same as that for D-type ones, but always skips spaces (as it is mandatory) and has a hard-coded error message.



```

1569 \cs_new_protected:Npn \__cmd_grab_R:w #1#2#3 \__cmd_run_code:
1570 { \__cmd_grab_R_aux:NNnN #1 #2 {#3} \cs_set_protected_nopar:Npn }
1571 \cs_new_protected:Npn \__cmd_grab_R_long:w #1#2#3 \__cmd_run_code:
1572 { \__cmd_grab_R_aux:NNnN #1 #2 {#3} \cs_set_protected:Npn }
1573 \cs_new_protected:Npn \__cmd_grab_R_aux:NNnN #1#2#3#4
1574 {
1575   \__cmd_grab_D_aux:NNnN #1 #2 {#3} #4
1576   \__cmd_peek_nonspace_remove:NTF #1
1577   { \__cmd_grab_D_call:Nw #1 }
1578   {
1579     \msg_error:nxxx { cmd } { missing-required }
1580     { \__cmd_environment_or_command: }
1581     { \token_to_str:N #1 }
1582     \__cmd_add_arg:o \c_novalue_tl
1583   }
1584 }

```

(End definition for `\__cmd_grab_R:w`, `\__cmd_grab_R_long:w`, and `\__cmd_grab_R_aux:NNnN`.)

`\__cmd_grab_t:w` Dealing with a token is quite easy. Check the match, remove the token if needed and add a flag to the output.

```

\__cmd_grab_t_obey_spaces:w
\__cmd_grab_t_aux:NNw
1585 \cs_new_protected:Npn \__cmd_grab_t:w
1586 { \__cmd_grab_t_aux:NNw \__cmd_peek_nonspace_remove:NTF }
1587 \cs_new_protected:Npn \__cmd_grab_t_obey_spaces:w
1588 { \__cmd_grab_t_aux:NNw \__cmd_peek_meaning_remove:NTF }
1589 \cs_new_protected:Npn \__cmd_grab_t_aux:NNw #1#2#3 \__cmd_run_code:
1590 {
1591   \tl_set:Nn \l__cmd_signature_tl {#3}
1592   \exp_after:wN \cs_set_protected:Npn \l__cmd_fn_tl
1593   {
1594     #1 #2
1595     { \__cmd_add_arg:n { \BooleanTrue } }
1596     { \__cmd_add_arg:n { \BooleanFalse } }
1597   }
1598   \l__cmd_fn_tl
1599 }

```

(End definition for `\__cmd_grab_t:w`, `\__cmd_grab_t_obey_spaces:w`, and `\__cmd_grab_t_aux:NNw`.)

---

```

\l__cmd_v_arg_tl
1600 \tl_new:N \l__cmd_v_arg_tl

```

`\__cmd_grab_v:w` The opening delimiter is the first non-space token, and is never read verbatim. This is required by consistency with the case where the preceding argument was optional and absent: then `TEX` has already read and tokenized that token when looking for the optional argument. The first thing is thus to check is that this delimiter is a character, and to distinguish the case of a left brace (in that case, `\group_align_safe_end:` is needed to compensate for the begin-group character that was just seen). Then set verbatim catcodes with `\__cmd_grab_v_aux_catcodes:`.

The group keep catcode changes local, and `\group_align_safe_begin/end:` allow to use a character with category code 4 (normally `&`) as the delimiter (all commands do `\group_align_safe_begin/end:`, so there's no need to do that again here). It is

ended by `\__cmd_grab_v_group_end:`, which smuggles the collected argument out of the group.

```

1601 \cs_new_protected:Npn \__cmd_grab_v:w
1602 {
1603   \bool_set_false:N \l__cmd_long_bool
1604   \__cmd_grab_v_aux:w
1605 }
1606 \cs_new_protected:Npn \__cmd_grab_v_long:w
1607 {
1608   \bool_set_true:N \l__cmd_long_bool
1609   \__cmd_grab_v_aux:w
1610 }
1611 \cs_new_protected:Npn \__cmd_grab_v_aux:w #1 \__cmd_run_code:
1612 {
1613   \tl_set:Nn \l__cmd_signature_tl {#1}
1614   \group_begin:
1615     \tex_escapechar:D = 92 \scan_stop:
1616     \tl_clear:N \l__cmd_v_arg_tl
1617     \peek_remove_spaces:n
1618     {
1619       \peek_meaning_remove:NTF \c_group_begin_token
1620       {
1621         \group_align_safe_end:
1622         \__cmd_grab_v_bgroup:
1623       }
1624       {
1625         \peek_N_type:TF
1626         { \__cmd_grab_v_aux_test:N }
1627         { \__cmd_grab_v_aux_abort:n { } }
1628       }
1629     }
1630 }
1631 \cs_new_protected:Npn \__cmd_grab_v_group_end:
1632 {
1633   \exp_args:NNNo
1634   \group_end:
1635   \tl_set:Nn \l__cmd_v_arg_tl { \l__cmd_v_arg_tl }
1636 }

```

(End definition for `\__cmd_grab_v:w` and others.)

```

\__cmd_grab_v_aux_test:N
\__cmd_grab_v_aux_loop:N
\__cmd_grab_v_aux_loop:NN
\__cmd_grab_v_aux_loop_end:

```

Check that the opening delimiter is a character, setup category codes, then start reading tokens one by one, keeping the delimiter as an argument. If the verbatim was not nested, we will be grabbing one character at each step. Unfortunately, it can happen that what follows the verbatim argument is already tokenized. Thus, we check at each step that the next token is indeed a “nice” character, *i.e.*, is not a character with category code 1 (begin-group), 2 (end-group) or 6 (macro parameter), nor the space character, with category code 10 and character code 32, nor a control sequence. The partially built argument is stored in `\l__cmd_v_arg_tl`. If we ever meet a token which we cannot grab (non-N-type), or which is not a character according to `\__cmd_grab_v_token_if_char:NTF`, then we bail out with `\__cmd_grab_v_aux_abort:n`. Otherwise, we stop at the first character matching the delimiter.

```

1637 \cs_new_protected:Npn \__cmd_grab_v_aux_test:N #1

```

```

1638 {
1639   \__cmd_grab_v_token_if_char:NTF #1
1640   {
1641     \__cmd_grab_v_aux_put:N #1
1642     \__cmd_grab_v_aux_catcodes:
1643     \__cmd_grab_v_aux_loop:N #1
1644   }
1645   { \__cmd_grab_v_aux_abort:n {#1} #1 }
1646 }
1647 \cs_new_protected:Npn \__cmd_grab_v_aux_loop:N #1
1648 {
1649   \peek_N_type:TF
1650   { \__cmd_grab_v_aux_loop:NN #1 }
1651   { \__cmd_grab_v_aux_abort:n { } }
1652 }
1653 \cs_new_protected:Npn \__cmd_grab_v_aux_loop:NN #1#2
1654 {
1655   \__cmd_grab_v_token_if_char:NTF #2
1656   {
1657     \token_if_eq_charcode:NNTF #1 #2
1658     { \__cmd_grab_v_aux_loop_end: }
1659     {
1660       \__cmd_grab_v_aux_put:N #2
1661       \__cmd_grab_v_aux_loop:N #1
1662     }
1663   }
1664   { \__cmd_grab_v_aux_abort:n {#2} #2 }
1665 }
1666 \cs_new_protected:Npn \__cmd_grab_v_aux_loop_end:
1667 {
1668   \__cmd_grab_v_group_end:
1669   \__cmd_add_arg:x { \tl_tail:N \l__cmd_v_arg_tl }
1670 }

```

(End definition for \\_\_cmd\_grab\_v\_aux\_test:N and others.)

---

```

\l__cmd_v_nesting_int 1671 \int_new:N \l__cmd_v_nesting_int

```

\\_\_cmd\_grab\_v\_bgroup: If the opening delimiter is a left brace, we keep track of how many left and right braces were encountered so far in \l\_\_cmd\_v\_nesting\_int (the methods used for optional arguments cannot apply here), and stop as soon as it reaches 0.

Some care was needed when removing the opening delimiter, which has already been assigned category code 1: using \peek\_meaning\_remove:NTF in the \\_\_cmd\_grab\_v\_aux:w function would break within alignments. Instead, we first convert that token to a string, and remove the result as a normal undelimited argument.

```

1672 \cs_new_protected:Npx \__cmd_grab_v_bgroup:
1673 {
1674   \exp_not:N \__cmd_grab_v_aux_catcodes:
1675   \exp_not:n { \int_set:Nn \l__cmd_v_nesting_int { 1 } }
1676   \exp_not:N \__cmd_grab_v_aux_put:N \iow_char:N \{
1677   \exp_not:N \__cmd_grab_v_bgroup_loop:
1678 }

```

```

1679 \cs_new_protected:Npn \__cmd_grab_v_bgroup_loop:
1680 {
1681   \peek_N_type:TF
1682   { \__cmd_grab_v_bgroup_loop:N }
1683   { \__cmd_grab_v_aux_abort:n { } }
1684 }
1685 \cs_new_protected:Npn \__cmd_grab_v_bgroup_loop:N #1
1686 {
1687   \__cmd_grab_v_token_if_char:NNTF #1
1688   {
1689     \token_if_eq_charcode:NNTF \c_group_end_token #1
1690     {
1691       \int_decr:N \l__cmd_v_nesting_int
1692       \int_compare:nNnTF \l__cmd_v_nesting_int > 0
1693       {
1694         \__cmd_grab_v_aux_put:N #1
1695         \__cmd_grab_v_bgroup_loop:
1696       }
1697       { \__cmd_grab_v_aux_loop_end: }
1698     }
1699     {
1700       \token_if_eq_charcode:NNT \c_group_begin_token #1
1701       { \int_incr:N \l__cmd_v_nesting_int }
1702       \__cmd_grab_v_aux_put:N #1
1703       \__cmd_grab_v_bgroup_loop:
1704     }
1705   }
1706   { \__cmd_grab_v_aux_abort:n {#1} #1 }
1707 }

```

(End definition for \\_\_cmd\_grab\_v\_bgroup:, \\_\_cmd\_grab\_v\_bgroup\_loop:, and \\_\_cmd\_grab\_v\_bgroup\_loop:N.)

\\_\_cmd\_grab\_v\_aux\_catcodes: The approach for short verbatim arguments is to make the end-line character a macro parameter character: this is forbidden by the rest of the code. Then the error branch can check what caused the bail out and give the appropriate error message.

```

1708 \cs_new_protected:Npn \__cmd_grab_v_aux_catcodes:
1709 {
1710   \cs_set_eq:NN \do \char_set_catcode_other:N
1711   \dospecials
1712   \tex_endlinechar:D = '\^M \scan_stop:
1713   \bool_if:NNTF \l__cmd_long_bool
1714   { \char_set_catcode_other:n { \tex_endlinechar:D } }
1715   { \char_set_catcode_parameter:n { \tex_endlinechar:D } }
1716 }
1717 \cs_new_protected:Npn \__cmd_grab_v_aux_abort:n #1
1718 {
1719   \__cmd_grab_v_group_end:
1720   \exp_after:wN \exp_after:wN \exp_after:wN
1721   \peek_meaning_remove:NNTF \char_generate:nn { \tex_endlinechar:D } { 6 }
1722   {
1723     \msg_error:nnxxx { cmd } { verbatim-nl }
1724     { \__cmd_environment_or_command: }
1725     { \tl_to_str:N \l__cmd_v_arg_tl }

```

```

1726         { \tl_to_str:n {#1} }
1727     \__cmd_add_arg:o \c_novalue_tl
1728 }
1729 {
1730     \msg_error:nnxxx { cmd } { verbatim-tokenized }
1731     { \__cmd_environment_or_command: }
1732     { \tl_to_str:N \l__cmd_v_arg_tl }
1733     { \tl_to_str:n {#1} }
1734     \__cmd_add_arg:o \c_novalue_tl
1735 }
1736 }

```

(End definition for \\_\_cmd\_grab\_v\_aux\_catcodes: and \\_\_cmd\_grab\_v\_aux\_abort:n.)

\\_\_cmd\_grab\_v\_aux\_put:N Storing one token in the collected argument. Most tokens are converted to category code 12, with the exception of active characters, and spaces (not sure what should be done for those).

```

1737 \cs_new_protected:Npn \__cmd_grab_v_aux_put:N #1
1738 {
1739     \tl_put_right:Nx \l__cmd_v_arg_tl
1740     {
1741         \token_if_active:NTF #1
1742         { \exp_not:N #1 } { \token_to_str:N #1 }
1743     }
1744 }

```

(End definition for \\_\_cmd\_grab\_v\_aux\_put:N.)

\\_\_cmd\_grab\_v\_token\_if\_char:NTF This function assumes that the escape character is printable. Then the string representation of control sequences is at least two characters, and \str\_tail:n only removes the escape character. Macro parameter characters are doubled by \tl\_to\_str:n, and will also yield a non-empty result, hence are not considered as characters.

```

1745 \cs_new_protected:Npn \__cmd_grab_v_token_if_char:NTF #1
1746 { \str_if_eq:eeTF { } { \str_tail:n {#1} } }

```

(End definition for \\_\_cmd\_grab\_v\_token\_if\_char:NTF.)

\\_\_cmd\_add\_arg:n When an argument is found it is stored, then further arguments are grabbed by calling \l\_\_cmd\_signature\_tl.

```

\__cmd_add_arg:V \l__cmd_signature_tl.
\__cmd_add_arg:o
\__cmd_add_arg:x
1747 \cs_new_protected:Npn \__cmd_add_arg:n #1
1748 {
1749     \tl_put_right:Nn \l__cmd_args_tl { {#1} }
1750     \l__cmd_signature_tl \__cmd_run_code:
1751 }
1752 \cs_generate_variant:Nn \__cmd_add_arg:n { V , o , x }

```

(End definition for \\_\_cmd\_add\_arg:n.)

## 1.9 Grabbing arguments expandably

```

\__cmd_expandable_grab_D:w
  \__cmd_expandable_grab_D:NNNwNNn
    \__cmd_expandable_grab_D:NNNwNNnnn
\__cmd_expandable_grab_D:Nw
  \__cmd_expandable_grab_D:nnNNNwNN

```

The first step is to grab the first token or group. The generic grabbers  $\langle function \rangle_{\sqcup}$  and  $\langle function \rangle_{\sqcup}$  are just after  $\backslash q\_cmd$ , we go and find them (and use the long one).

```

1753 \cs_new:Npn \__cmd_expandable_grab_D:w #1 \q__cmd #2#3
1754   { #2 { \__cmd_expandable_grab_D:NNNwNNn #1 \q__cmd #2 #3 } }

```

We then wish to test whether #7, which we just grabbed, is exactly #2. A preliminary test is whether their string representations coincide, then expand the only grabber function we have, #1, once: the two strings below are equal if and only if #7 matches #2 exactly.<sup>2</sup> The preliminary test is needed as #7 could validly contain  $\backslash par$  (because a later mandatory argument could be long) and our grabber may be short. If #7 does not match #2, then the optional argument is missing, we use the default `-NoValue-`, and put back the argument #7 in the input stream.

If it does match, then interesting things need to be done. We will grab the argument piece by piece, with the following pattern:

```

\grabber { \tokens }
\q_nil { \piece 1 } \piece 2 \ERROR \q__cmd
\q_nil \input stream

```

The  $\langle grabber \rangle$  will find an opening delimiter in  $\langle piece 2 \rangle$ , take the  $\backslash q\_cmd$  as a second delimiter, and find more material delimited by the closing delimiter in the  $\langle input stream \rangle$ . We then move the part before the opening delimiter from  $\langle piece 2 \rangle$  to  $\langle piece 1 \rangle$ , and the material taken from the  $\langle input stream \rangle$  to the  $\langle piece 2 \rangle$ . Thus, the argument moves gradually from the  $\langle input stream \rangle$  to the  $\langle piece 2 \rangle$ , then to the  $\langle piece 1 \rangle$  when we have made sure to find all opening and closing delimiters. This two-step process ensures that nesting works: the number of opening delimiters minus closing delimiters in  $\langle piece 1 \rangle$  is always equal to the number of closing delimiters in  $\langle piece 2 \rangle$ . We stop grabbing arguments once the  $\langle piece 2 \rangle$  contains no opening delimiter any more, hence the balance is reached, and the final argument is  $\langle piece 1 \rangle \langle piece 2 \rangle$ . The indirection via  $\backslash\_cmd\_tmp:w$  allows to insert `-NoValue-` expanded.

```

1755 \cs_set_protected:Npn \__cmd_tmp:w #1
1756   {
1757     \cs_new:Npn \__cmd_expandable_grab_D:NNNwNNn ##1##2##3##4 \q__cmd ##5##6##7
1758       {
1759         \str_if_eq:nnTF {##2} {##7}
1760           {
1761             \str_if_eq:onTF
1762               { ##1 { } { } } ##7 ##2 \q__cmd ##3 }
1763             { { } {##2} { } }
1764           }
1765         { \use_ii:nn }
1766         {
1767           ##1
1768           { \__cmd_expandable_grab_D:NNNwNNnnn ##1##2##3##4 \q__cmd ##5##6 }

```

<sup>2</sup>It is obvious that if #7 matches #2 then the strings are equal. We must check the converse. The right-hand-side of  $\backslash str\_if\_eq:onTF$  does not end with #3, implying that the grabber function took everything as its arguments. The first brace group can only be empty if #7 starts with #2, otherwise the brace group preceding #7 would not vanish. The third brace group is empty, thus the  $\backslash q\_cmd$  that was used by our grabber #1 must be the one that we inserted (not some token in #7), hence the second brace group contains the end of #7 followed by #2. Since this is #2 on the right-hand-side, and no brace can be lost there, #7 must contain nothing else than its leading #2.

```

1769         \q_nil { } ##2 \ERROR \q__cmd \ERROR
1770     }
1771     { ##4 {#1} \q__cmd ##5 ##6 {##7} }
1772 }
1773 }

```

```

1774 \exp_args:No \__cmd_tmp:w { \c_novalue_tl }

```

At this stage, #7 is `\q_nil {<piece 1>}<more for piece 1>`, and we want to concatenate all that, removing `\q_nil`, and keeping the opening delimiter #2. Simply use `\use_ii:nn`. Also, #8 is `<remainder of piece 2> \ERROR`, and #9 is `\ERROR <more for piece 2>`. We concatenate those, replacing the two `\ERROR` by the closing delimiter #3.

```

1775 \cs_new:Npn \__cmd_expandable_grab_D:NNNwNNnnn #1#2#3#4 \q__cmd #5#6#7#8#9
1776 {
1777     \exp_args:Nof \__cmd_expandable_grab_D:nnNNNwNN
1778     { \use_ii:nn #7 #2 }
1779     { \__cmd_expandable_grab_D:Nw #3 \exp_stop_f: #8 #9 }
1780     #1#2#3 #4 \q__cmd #5 #6
1781 }
1782 \cs_new:Npn \__cmd_expandable_grab_D:Nw #1#2 \ERROR \ERROR { #2 #1 }

```

Armed with our two new *<pieces>*, we are ready to loop. However, we must first see if *<piece 2>* (here #2) contains any opening delimiter #4. Again, we expand #3, this time removing its whole output with `\use_none:nnn`. The test is similar to `\tl_if_in:nnTF`. The token list is empty if and only if #2 does not contain the opening delimiter. In that case, we are done, and put the argument (from which we remove a spurious pair of delimiters coming from how we started the loop). Otherwise, we go back to looping with `\__cmd_expandable_grab_D:NNNwNNnnn`. The code to deal with brace stripping is much the same as for the non-expandable case.

```

1783 \cs_new:Npn \__cmd_expandable_grab_D:nnNNNwNN #1#2#3#4#5#6 \q__cmd #7#8
1784 {
1785     \exp_args:No \tl_if_empty:oTF
1786     { #3 { \use_none:nnn } #2 \q__cmd #5 #4 \q__cmd #5 }
1787     {
1788         \tl_if_blank:oTF { \use_none:nn #1#2 }
1789         { \__cmd_put_arg_expandable:ow { \use_none:nn #1#2 } }
1790         {
1791             \str_if_eq:eeTF
1792             { \exp_not:o { \use_none:nn #1#2 } }
1793             { { \exp_not:o { \use_iii:nnnn #1#2 \q_nil } } }
1794             { \__cmd_put_arg_expandable:ow { \use_iii:nnn #1#2 } }
1795             { \__cmd_put_arg_expandable:ow { \use_none:nn #1#2 } }
1796         }
1797         #6 \q__cmd #7 #8
1798     }
1799     {
1800         #3
1801         { \__cmd_expandable_grab_D:NNNwNNnnn #3#4#5#6 \q__cmd #7 #8 }
1802         \q_nil {#1} #2 \ERROR \q__cmd \ERROR
1803     }
1804 }

```

(End definition for `\__cmd_expandable_grab_D:w` and others.)

```

\__cmd_expandable_grab_D_alt:w
\__cmd_expandable_grab_D_alt:NNwNNn
\__cmd_expandable_grab_D_alt:Nwn

```

When the delimiters are identical, nesting is not possible and a simplified approach is used. The test concept here is the same as for the case where the delimiters are different but there cannot be any nesting.

```

1805 \cs_new:Npn \__cmd_expandable_grab_D_alt:w #1 \q__cmd #2#3
1806 { #2 { \__cmd_expandable_grab_D_alt:NNwNNn #1 \q__cmd #2 #3 } }
1807 \cs_set_protected:Npn \__cmd_tmp:w #1
1808 {
1809   \cs_new:Npn \__cmd_expandable_grab_D_alt:NNwNNn ##1##2##3 \q__cmd ##4##5##6
1810   {
1811     \str_if_eq:nnTF {##6} {##2}
1812     {
1813       \str_if_eq:onTF
1814       { ##1 { } ##6 ##2 ##2 }
1815       { { } ##2 }
1816     }
1817     { \use_ii:nn }
1818     {
1819       ##1
1820       { \__cmd_expandable_grab_D_alt:NNwn ##4 ##5 ##3 \q__cmd }
1821       ##6 \ERROR
1822     }
1823     { ##3 {#1} \q__cmd ##4 ##5 {##6} }
1824   }
1825 }
1826 \exp_args:No \__cmd_tmp:w { \c_novalue_tl }
1827 \cs_new:Npn \__cmd_expandable_grab_D_alt:NNwn #1#2#3 \q__cmd #4
1828 {
1829   \tl_if_blank:oTF { \use_none:n #4 }
1830   { \__cmd_put_arg_expandable:ow { \use_none:n #4 } }
1831   {
1832     \str_if_eq:eeTF
1833     { \exp_not:o { \use_none:n #4 } }
1834     { { \exp_not:o { \use_ii:nnn #4 \q_nil } } }
1835     { \__cmd_put_arg_expandable:ow { \use_ii:nn #4 } }
1836     { \__cmd_put_arg_expandable:ow { \use_none:n #4 } }
1837   }
1838   #3 \q__cmd #1 #2
1839 }

```

(End definition for \\_\_cmd\_expandable\_grab\_D\_alt:w, \\_\_cmd\_expandable\_grab\_D\_alt:NNwNNn, and \\_\_cmd\_expandable\_grab\_D\_alt:Nwn.)

```

\__cmd_expandable_grab_E:w
\__cmd_expandable_grab_E_long:w
\__cmd_expandable_grab_E_aux:w
\__cmd_expandable_grab_E_test:nnw
\__cmd_expandable_grab_E_loop:nnnNNw
\__cmd_expandable_grab_E_find:w
\__cmd_expandable_grab_E_find:nnw
\__cmd_expandable_grab_E_end:nnw

```

We keep track of long/short by placing the appropriate grabber as the third token after \q\_\_cmd; it is eventually removed by the end:nnw auxiliary. The aux:w auxiliary will be called repeatedly with two arguments: the set of pairs  $\langle parser \rangle \langle token \rangle$ , and the set of arguments found so far (initially all {-NoValue-}). At each step, grab what follows in the input stream then call the loop:nnnNNw auxiliary to compare it with each possible embellishment in turn. This auxiliary's #1 is what was found in the input, #2 collects  $\langle parser \rangle \langle token \rangle$  pairs that did not match, #3 collects the corresponding arguments found previously, #4 and #5 is the current pair, #6 is the remaining pairs, #7 is empty or two \q\_nil, and #8 is the current argument. If none of the pairs matched (determined by \quark\_if\_nil:NTF) then call the end auxiliary to stop looking for embellishments, remembering to put what was grabbed in the input back where it belongs, and storing



the arguments found just before `\q__cmd`. If the current argument #8 is not `-NoValue-` or if the input #1 does not match #5 (see `t-type` arguments below for a similar `\str_if_eq:onTF` test) then carry on the loop. Otherwise, we found a new embellishment: grab the corresponding argument in the input using the `find:w` auxiliary. To avoid losing braces around that auxiliary's argument we include a space, which will be eliminated in the next loop through embellishments.

```

1840 \cs_new:Npn \__cmd_expandable_grab_E:w #1 \q__cmd #2#3
1841   { \__cmd_expandable_grab_E_aux:w #1 \q__cmd #2 #3 #3 }
1842 \cs_new:Npn \__cmd_expandable_grab_E_long:w #1 \q__cmd #2#3
1843   { \__cmd_expandable_grab_E_aux:w #1 \q__cmd #2 #3 #2 }
1844 \cs_new:Npn \__cmd_expandable_grab_E_aux:w #1 \q__cmd #2#3#4
1845   { #2 { \__cmd_expandable_grab_E_test:nnw #1 \q__cmd #2 #3 #4 } }
1846 \cs_new:Npn \__cmd_expandable_grab_E_test:nnw #1#2#3 \q__cmd #4#5#6#7
1847   {
1848     \__cmd_expandable_grab_E_loop:nnnNNw {#7} { } { }
1849     #1 \q_nil \q_nil \q_nil \q_mark #2 \q_nil
1850     #3 \q__cmd #4 #5 #6
1851   }
1852 \cs_new:Npn \__cmd_expandable_grab_E_loop:nnnNNw
1853   #1#2#3#4#5#6 \q_nil #7 \q_mark #8
1854   {
1855     \quark_if_nil:NTF #4
1856     { \__cmd_expandable_grab_E_end:nnw {#1} {#3} }
1857     {
1858       \tl_if_novalue:NTF {#8}
1859       { \str_if_eq:onTF { #4 { } #1 #5 } {#5} }
1860       { \use_ii:nn }
1861       { \__cmd_expandable_grab_E_find:w { #2 #4 #5 #6 } {#3} ~ }
1862       {
1863         \__cmd_expandable_grab_E_loop:nnnNNw
1864         {#1} { #2 #4 #5 } { #3 {#8} }
1865         #6 \q_nil #7 \q_mark
1866       }
1867     }
1868   }
1869 \cs_new:Npn \__cmd_expandable_grab_E_find:w #1 \q__cmd #2#3#4
1870   { #4 { \__cmd_expandable_grab_E_find:nnw #1 \q__cmd #2 #3 #4 } }
1871 \cs_new:Npn \__cmd_expandable_grab_E_find:nnw #1#2#3 \q_nil #4 \q__cmd #5#6#7#8
1872   { \__cmd_expandable_grab_E_aux:w {#1} { #2 {#8} #3 } #4 \q__cmd #5 #6 #7 }
1873 \cs_new:Npn \__cmd_expandable_grab_E_end:nnw #1#2#3 \q__cmd #4#5#6
1874   { #3 #2 \q__cmd #4 #5 {#1} }

```

(End definition for `\__cmd_expandable_grab_E:w` and others.)

```

\__cmd_expandable_grab_m:w
  \__cmd_expandable_grab_m_long:w
  \__cmd_expandable_grab_m_aux:wNn

```

The mandatory case is easy: find the auxiliary after the `\q__cmd`, and use it directly to grab the argument, then correctly position the argument before `\q__cmd`.

```

1875 \cs_new:Npn \__cmd_expandable_grab_m:w #1 \q__cmd #2#3
1876   { #3 { \__cmd_expandable_grab_m_aux:wNn #1 \q__cmd #2 #3 } }
1877 \cs_new:Npn \__cmd_expandable_grab_m_long:w #1 \q__cmd #2#3
1878   { #2 { \__cmd_expandable_grab_m_aux:wNn #1 \q__cmd #2 #3 } }
1879 \cs_new:Npn \__cmd_expandable_grab_m_aux:wNn #1 \q__cmd #2#3#4
1880   { #1 {#4} \q__cmd #2 #3 }

```

(End definition for `\__cmd_expandable_grab_m:w`, `\__cmd_expandable_grab_m_long:w`, and `\__cmd_expandable_grab_m_aux:wNn`.)

`\__cmd_expandable_grab_R:w` Much the same as for the D-type argument, with only the lead-off function varying.  
`\__cmd_expandable_grab_R_aux:NNwNNn`

```

1881 \cs_new:Npn \__cmd_expandable_grab_R:w #1 \q__cmd #2#3
1882 { #2 { \__cmd_expandable_grab_R_aux:NNwNNn #1 \q__cmd #2#3 } }
1883 \cs_set_protected:Npn \__cmd_tmp:w #1
1884 {
1885   \cs_new:Npn \__cmd_expandable_grab_R_aux:NNwNNn ##1##2##3##4 \q__cmd ##5##6##7
1886   {
1887     \str_if_eq:nnTF {##7} {##2}
1888     {
1889       \str_if_eq:onTF
1890       { ##1 { } { } } ##7 ##2 \q__cmd ##3 }
1891       { { } {##2} { } }
1892     }
1893     { \use_ii:nn }
1894     {
1895       ##1
1896       { \__cmd_expandable_grab_D:NNwNNnnn ##1##2##3##4 \q__cmd ##5##6 }
1897       \q_nil { } ##2 \ERROR \q__cmd \ERROR
1898     }
1899     {
1900       \msg_expandable_error:nnff { cmd } { missing-required }
1901       { \exp_args:Nf \tl_trim_spaces:n { \token_to_str:N ##5 } }
1902       { \tl_to_str:n {##2} }
1903       ##4 {#1} \q__cmd ##5 ##6 {##7}
1904     }
1905   }
1906 }
1907 \exp_args:No \__cmd_tmp:w { \c_novalue_tl }

```

(End definition for `\__cmd_expandable_grab_R:w` and `\__cmd_expandable_grab_R_aux:NNwNNn`.)

`\__cmd_expandable_grab_R_alt:w` When the delimiters are identical, nesting is not possible and a simplified approach is  
`\__cmd_expandable_grab_R_alt_aux:NNwNNn` used. The test concept here is the same as for the case where the delimiters are different.

```

1908 \cs_new:Npn \__cmd_expandable_grab_R_alt:w #1 \q__cmd #2#3
1909 { #2 { \__cmd_expandable_grab_R_alt_aux:NNwNNn #1 \q__cmd #2#3 } }
1910 \cs_set_protected:Npn \__cmd_tmp:w #1
1911 {
1912   \cs_new:Npn \__cmd_expandable_grab_R_alt_aux:NNwNNn ##1##2##3 \q__cmd ##4##5##6
1913   {
1914     \str_if_eq:nnTF {##6} {##2}
1915     {
1916       \str_if_eq:onTF
1917       { ##1 { } ##6 ##2 ##2 }
1918       { { } ##2 }
1919     }
1920     { \use_ii:nn }
1921     {
1922       ##1
1923       { \__cmd_expandable_grab_D_alt:NNwn ##4 ##5 ##3 \q__cmd }
1924       ##6 \ERROR
1925     }
1926     {
1927       \msg_expandable_error:nnff { cmd } { missing-required }
1928       { \exp_args:Nf \tl_trim_spaces:n { \token_to_str:N ##4 } }

```

```

1929         { \tl_to_str:n {##2} }
1930         ##3 {#1} \q__cmd ##4 ##5 {##6}
1931     }
1932 }
1933 }
1934 \exp_args:No \__cmd_tmp:w { \c_novalue_tl }

```

*(End definition for \\_\_cmd\_expandable\_grab\_R\_alt:w and  
\\_\_cmd\_expandable\_grab\_R\_alt\_aux:NNwNNn.)*

\\_\_cmd\_expandable\_grab\_t:w As for a D-type argument, here we compare the grabbed tokens using the only parser we  
\\_\_cmd\_expandable\_grab\_t\_aux:NNwn have in order to work out if #2 is exactly equal to the output of the grabber.

```

1935 \cs_new:Npn \__cmd_expandable_grab_t:w #1 \q__cmd #2#3
1936 { #2 { \__cmd_expandable_grab_t_aux:NNwn #1 \q__cmd #2 #3 } }
1937 \cs_new:Npn \__cmd_expandable_grab_t_aux:NNwn #1#2#3 \q__cmd #4#5#6
1938 {
1939     \str_if_eq:onTF { #1 { } #6 #2 } {#2}
1940     { #3 { \BooleanTrue } \q__cmd #4 #5 }
1941     { #3 { \BooleanFalse } \q__cmd #4 #5 {#6} }
1942 }

```

*(End definition for \\_\_cmd\_expandable\_grab\_t:w and \\_\_cmd\_expandable\_grab\_t\_aux:NNwn.)*

\\_\_cmd\_put\_arg\_expandable:nw A useful helper, to store arguments when they are ready.  
\\_\_cmd\_put\_arg\_expandable:ow

```

1943 \cs_new:Npn \__cmd_put_arg_expandable:nw #1#2 \q__cmd { #2 {#1} \q__cmd }
1944 \cs_generate_variant:Nn \__cmd_put_arg_expandable:nw { o }

```

*(End definition for \\_\_cmd\_put\_arg\_expandable:nw.)*

## 1.10 Argument processors

\\_\_cmd\_bool\_reverse:N A simple reversal.

```

1945 \cs_new_protected:Npn \__cmd_bool_reverse:N #1
1946 {
1947     \bool_if:NTF #1
1948     { \tl_set:Nn \ProcessedArgument { \c_false_bool } }
1949     { \tl_set:Nn \ProcessedArgument { \c_true_bool } }
1950 }

```

*(End definition for \\_\_cmd\_bool\_reverse:N.)*

---

$\backslash l\_cmd\_split\_list\_seq$ $\backslash l\_cmd\_split\_list\_tl$ $\backslash\_cmd\_split\_list\_multi:nn$ $\backslash\_cmd\_split\_list\_multi:nV$ $\backslash\_cmd\_split\_list\_single:Nn$	Splitting can take place either at a single token or at a longer identifier. To deal with single active tokens, a two-part procedure is needed.	1951 $\backslash seq\_new:N \backslash l\_cmd\_split\_list\_seq$ 1952 $\backslash tl\_new:N \backslash l\_cmd\_split\_list\_tl$ 1953 $\backslash cs\_new\_protected:Npn \backslash\_cmd\_split\_list:nn \#1\#2$ 1954 { 1955 $\backslash tl\_if\_single:nTF \{ \#1 \}$ 1956     { 1957 $\backslash token\_if\_cs:NTF \#1$ 1958         { $\backslash\_cmd\_split\_list\_multi:nn \{ \#1 \} \{ \#2 \}$ } 1959         { $\backslash\_cmd\_split\_list\_single:Nn \#1 \{ \#2 \}$ } 1960     } 1961     { $\backslash\_cmd\_split\_list\_multi:nn \{ \#1 \} \{ \#2 \}$ } 1962   } 1963 $\backslash cs\_new\_protected:Npn \backslash\_cmd\_split\_list\_multi:nn \#1\#2$ 1964 { 1965 $\backslash seq\_set\_split:Nnn \backslash l\_cmd\_split\_list\_seq \{ \#1 \} \{ \#2 \}$ 1966 $\backslash tl\_clear:N \backslash ProcessedArgument$ 1967 $\backslash seq\_map\_inline:Nn \backslash l\_cmd\_split\_list\_seq$ 1968     { $\backslash tl\_put\_right:Nn \backslash ProcessedArgument \{ \{ \#1 \} \}$ } 1969   } 1970 $\backslash cs\_generate\_variant:Nn \backslash\_cmd\_split\_list\_multi:nn \{ nV \}$ 1971 $\backslash group\_begin:$ 1972 $\backslash char\_set\_catcode\_active:N \wedge\wedge@$ 1973 $\backslash cs\_new\_protected:Npn \backslash\_cmd\_split\_list\_single:Nn \#1\#2$ 1974 { 1975 $\backslash tl\_set:Nn \backslash l\_cmd\_split\_list\_tl \{ \#2 \}$ 1976 $\backslash group\_begin:$ 1977 $\backslash char\_set\_lccode:nn \{ '\wedge\wedge@ \} \{ '\#1 \}$ 1978 $\backslash tex\_lowercase:D$ 1979     { 1980 $\backslash group\_end:$ 1981 $\backslash tl\_replace\_all:Nnn \backslash l\_cmd\_split\_list\_tl \{ \wedge\wedge@ \}$ 1982         } { $\#1$ } 1983 $\backslash\_cmd\_split\_list\_multi:nV \{ \#1 \} \backslash l\_cmd\_split\_list\_tl$ 1984     } 1985 $\backslash group\_end:$	<i>(End definition for <math>\backslash\_cmd\_split\_list:nn</math>, <math>\backslash\_cmd\_split\_list\_multi:nn</math>, and <math>\backslash\_cmd\_split\_list\_single:Nn</math>.)</i>
--	---	---	--

  

$\backslash\_cmd\_split\_argument:nnn$ $\backslash\_cmd\_split\_argument\_aux:nnnn$ $\backslash\_cmd\_split\_argument\_aux:n$ $\backslash\_cmd\_split\_argument\_aux:wn$	Splitting to a known number of items is a special version of splitting a list, in which the limit is hard-coded and where there will always be exactly the correct number of output items. An auxiliary function is used to save on working out the token list length several times.	1986 $\backslash cs\_new\_protected:Npn \backslash\_cmd\_split\_argument:nnn \#1\#2\#3$ 1987 { 1988 $\backslash\_cmd\_split\_list:nn \{ \#2 \} \{ \#3 \}$ 1989 $\backslash exp\_args:Nf \backslash\_cmd\_split\_argument\_aux:nnnn$ 1990     { $\backslash tl\_count:N \backslash ProcessedArgument$ } 1991     { $\#1$ } { $\#2$ } { $\#3$ } 1992   }
---	--	--

```

1993 \cs_new_protected:Npn \__cmd_split_argument_aux:nnnn #1#2#3#4
1994 {
1995   \int_compare:nNnF {#1} = { #2 + 1 }
1996   {
1997     \int_compare:nNnTF {#1} > { #2 + 1 }
1998     {
1999       \tl_set:Nx \ProcessedArgument
2000       {
2001         \exp_last_unbraced:NnNo
2002         \__cmd_split_argument_aux:n
2003         { #2 + 1 }
2004         \use_none_delimit_by_q_stop:w
2005         \ProcessedArgument
2006         \q_stop
2007       }
2008       \msg_error:nnxxx { cmd } { arg-split }
2009       { \tl_to_str:n {#3} } { \int_eval:n { #2 + 1 } }
2010       { \tl_to_str:n {#4} }
2011     }
2012   }
2013   \tl_put_right:Nx \ProcessedArgument
2014   {
2015     \prg_replicate:nn { #2 + 1 - (#1) }
2016     { { \exp_not:V \c_novalue_tl } }
2017   }
2018 }
2019 }
2020 }

```

Auxiliaries to leave exactly the correct number of arguments in \ProcessedArgument.

```

2021 \cs_new:Npn \__cmd_split_argument_aux:n #1
2022 { \prg_replicate:nn {#1} { \__cmd_split_argument_aux:wn } }
2023 \cs_new:Npn \__cmd_split_argument_aux:wn #1 \use_none_delimit_by_q_stop:w #2
2024 {
2025   \exp_not:n { {#2} }
2026   #1
2027   \use_none_delimit_by_q_stop:w
2028 }

```

(End definition for \\_\_cmd\_split\_argument:nnn and others.)

\\_\_cmd\_trim\_spaces:n This one is almost trivial.

```

2029 \cs_new_protected:Npn \__cmd_trim_spaces:n #1
2030 { \tl_set:Nx \ProcessedArgument { \tl_trim_spaces:n {#1} } }

```

(End definition for \\_\_cmd\_trim\_spaces:n.)

## 1.11 Access to the argument specification

\\_\_cmd\_get\_arg\_spec\_error:N Provide an informative error when trying to get the argument specification of a non-xparse command or environment.

```

\__cmd_get_arg_spec_error:n
\__cmd_get_arg_spec_error_aux:n
2031 \cs_new_protected:Npn \__cmd_get_arg_spec_error:N #1
2032 {
2033   \bool_set_false:N \l__cmd_environment_bool

```

```

2034 \tl_set:Nn \l__cmd_fn_tl {#1}
2035 \__cmd_get_arg_spec_error_aux:n { \cs_if_exist:NTF #1 }
2036 }
2037 \cs_new_protected:Npn \__cmd_get_arg_spec_error:n #1
2038 {
2039   \bool_set_true:N \l__cmd_environment_bool
2040   \str_set:Nx \l__cmd_environment_str {#1}
2041   \__cmd_get_arg_spec_error_aux:n
2042     { \cs_if_exist:cTF { \l__cmd_environment_str } }
2043 }
2044 \cs_new_protected:Npn \__cmd_get_arg_spec_error_aux:n #1
2045 {
2046   #1
2047   {
2048     \msg_error:nnx { cmd } { non-xparse }
2049     { \__cmd_environment_or_command: }
2050   }
2051   {
2052     \msg_error:nnx { cmd } { unknown }
2053     { \__cmd_environment_or_command: }
2054   }
2055 }

```

(End definition for \\_\_cmd\_get\_arg\_spec\_error:N, \\_\_cmd\_get\_arg\_spec\_error:n, and  
\\_\_cmd\_get\_arg\_spec\_error\_aux:n.)

\\_\_cmd\_get\_arg\_spec:NTF If the command is not an xparse command, complain. If it is, its second “item” is the argument specification.

```

2056 \cs_new_protected:Npn \__cmd_get_arg_spec:NTF #1#2#3
2057 {
2058   \__kernel_cmd_if_xparse:NTF #1
2059   {
2060     \tl_set:Nx \ArgumentSpecification { \tl_item:Nn #1 { 2 } }
2061     #2
2062   }
2063   {#3}
2064 }

```

(End definition for \\_\_cmd\_get\_arg\_spec:NTF.)

Rolling forward from 2020-10-01 is tricky because the entire `ltxcmd` module is new, but the user-level commands have the same name, so only these will clash. To work around that, in `latexrelease` mode we will (temporarily) disable `\__kernel_chk_if_free_cs:N` for this final part of the code, then restore at the end.

```

2065 <latexrelease>\cs_new_eq:NN \__cmd_chk_if_free_cs:N \__kernel_chk_if_free_cs:N
2066 <latexrelease>\cs_gset_eq:NN \__kernel_chk_if_free_cs:N \use_none:n

```

---

## \ArgumentSpecification

```

2067 \tl_new:N \ArgumentSpecification

```

\\_\_cmd\_get\_arg\_spec:N Recovering the argument specification is now trivial.

```

\__cmd_get_arg_spec:n
2068 \cs_new_protected:Npn \__cmd_get_arg_spec:N #1
2069 {
2070   \__cmd_get_arg_spec:NTF #1 { }

```

```

2071     { \__cmd_get_arg_spec_error:N #1 }
2072   }
2073 \cs_new_protected:Npn \__cmd_get_arg_spec:n #1
2074 {
2075   \exp_args:Nc \__cmd_get_arg_spec:NTF
2076     { environment~ \tl_to_str:n {#1} }
2077   { }
2078   { \__cmd_get_arg_spec_error:n {#1} }
2079 }

```

(End definition for \\_\_cmd\_get\_arg\_spec:N and \\_\_cmd\_get\_arg\_spec:n.)

\\_\_cmd\_show\_arg\_spec:N Showing the argument specification simply means finding it and then calling the \tl\_show:N function.

```

\__cmd_show_arg_spec:n
2080 \cs_new_protected:Npn \__cmd_show_arg_spec:N #1
2081 {
2082   \__cmd_get_arg_spec:NTF #1
2083     { \tl_show:N \ArgumentSpecification }
2084     { \__cmd_get_arg_spec_error:N #1 }
2085 }
2086 \cs_new_protected:Npn \__cmd_show_arg_spec:n #1
2087 {
2088   \exp_args:Nc \__cmd_get_arg_spec:NTF
2089     { environment~ \tl_to_str:n {#1} }
2090     { \tl_show:N \ArgumentSpecification }
2091     { \__cmd_get_arg_spec_error:n {#1} }
2092 }

```

(End definition for \\_\_cmd\_show\_arg\_spec:N and \\_\_cmd\_show\_arg\_spec:n.)

## 1.12 Utilities

\\_\_cmd\_check\_definable:nNT  
 \\_\_cmd\_check\_definable\_aux:nN

Check that a token list is appropriate as a first argument of \NewDocumentCommand and similar functions and otherwise produce an error. First trim whitespace to allow for spaces around the actual command to be defined. If the result has multiple tokens, it is not a valid argument. The single token is a control sequence exactly if its string representation has more than one character (using \token\_to\_str:N rather than \tl\_to\_str:n to avoid problems with macro parameter characters, and setting \tex\_escapechar:D to prevent it from being non-printable). Finally, check for an active character: this is done by lowercasing the token to fix its character code (arbitrarily to that of ?) and comparing the result to an active ?. Both control sequences and active characters are valid arguments, and non-active character tokens are not. In all cases, the group opened to keep assignments local must be closed.

```

2093 \cs_new_protected:Npn \__cmd_check_definable:nNT #1
2094 { \tl_trim_spaces_apply:nN {#1} \__cmd_check_definable_aux:nN }
2095 \group_begin:
2096   \char_set_catcode_active:n { '?' }
2097   \cs_new_protected:Npn \__cmd_check_definable_aux:nN #1#2
2098   {
2099     \group_begin:
2100     \tl_if_single_token:nTF {#1}
2101     {
2102       \int_set:Nn \tex_escapechar:D { 92 }

```

```

2103 \exp_args:Nx \tl_if_empty:nTF
2104 { \exp_args:No \str_tail:n { \token_to_str:N #1 } }
2105 {
2106   \exp_args:Nx \char_set_lccode:nn
2107   { ' \str_head:n {#1} } { ? }
2108   \tex_lowercase:D { \tl_if_eq:nnTF {#1} } { ? }
2109   { \group_end: \use_iii:nnn }
2110   { \group_end: \use_i:nnn }
2111 }
2112 { \group_end: \use_iii:nnn }
2113 }
2114 { \group_end: \use_ii:nnn }
2115 {
2116   \msg_error:nnxx { cmd } { not-definable }
2117   { \tl_to_str:n {#1} } { \token_to_str:N #2 }
2118 }
2119 {
2120   \msg_error:nnxx { cmd } { not-one-token }
2121   { \tl_to_str:n {#1} } { \token_to_str:N #2 }
2122 }
2123 }
2124 \group_end:

```

(End definition for `\__cmd_check_definable:nNT` and `\__cmd_check_definable_aux:nN`.)

`\__cmd_token_if_cs:NNTF` Based on the definition of `\__cmd_check_definable_aux:nN` above, but only checks for an actual control sequence (*i.e.*, `\<anything>`). `\tex_escapechar:D` is temporarily changed to a known value and then it checks if `\string#1` contains more than one character: if it does, it's a control sequence. This test differs from `\token_if_cs:NNTF` for example in `\token_if_cs:NNTF \c_group_begin_token {T}{F}`, where `\token_if_cs:NNTF` returns false.

```

2125 \cs_new_protected:Npn \__cmd_token_if_cs:NNTF #1
2126 {
2127   \group_begin:
2128   \int_set:Nn \tex_escapechar:D { 92 }
2129   \exp_args:Nx \tl_if_empty:nTF
2130   { \exp_args:No \str_tail:n { \token_to_str:N #1 } }
2131   { \group_end: \use_ii:nn }
2132   { \group_end: \use_i:nn }
2133 }

```

(End definition for `\__cmd_token_if_cs:NNTF`.)

`\__cmd_tl_mapthread_function:NNN` Analogue of `\seq_mapthread_function:NNN` for token lists.  
`\__cmd_tl_mapthread_function:nnN`  
`\__cmd_tl_mapthread_loop:w`

```

2134 \cs_new:Npn \__cmd_tl_mapthread_function:NNN #1#2#3
2135 {
2136   \exp_after:wN \exp_after:wN
2137   \exp_after:wN \__cmd_tl_mapthread_loop:w
2138   \exp_after:wN \exp_after:wN
2139   \exp_after:wN #3
2140   \exp_after:wN #1
2141   \exp_after:wN \q_recursion_tail
2142   \exp_after:wN \q_mark
2143   #2

```



```

2144 \q_recursion_tail
2145 \q_recursion_stop
2146 }
2147 \cs_new:Npn \__cmd_tl_mapthread_function:nnN #1#2#3
2148 {
2149   \__cmd_tl_mapthread_loop:w #3
2150   #1 \q_recursion_tail \q_mark
2151   #2 \q_recursion_tail \q_recursion_stop
2152 }
2153 \cs_new:Npn \__cmd_tl_mapthread_loop:w #1#2#3 \q_mark #4
2154 {
2155   \quark_if_recursion_tail_stop:n {#2}
2156   \quark_if_recursion_tail_stop:n {#4}
2157   #1 {#2} {#4}
2158   \__cmd_tl_mapthread_loop:w #1#3 \q_mark
2159 }

```

(End definition for `\__cmd_tl_mapthread_function:NNN`, `\__cmd_tl_mapthread_function:nnN`, and `\__cmd_tl_mapthread_loop:w`.)

`\__kernel_cmd_if_xparse:NTF` To determine whether the command is an xparse command check that its `arg_spec` is empty (this also excludes non-macros) and that its `replacement_spec` starts with either `\__cmd_start:nNNnnn` (non-expandable command) or `\__cmd_start_expandable:nNNNNn` (expandable command) or `\__cmd_start_env:nnnnn` (environment) or `\environment #1 end aux` (environment end).

This conditional is needed in several kernel modules and is therefore has a kernel-internal name.

```

2160 \cs_new_protected:Npn \__cmd_cmd_type_cases:NnnnnF #1 #2 #3 #4 #5 #6
2161 {
2162   \exp_args:Ne \str_case_e:nnF
2163   {
2164     \exp_args:Nf \tl_if_empty:nT { \cs_argument_spec:N #1 }
2165     { \exp_not:N \exp_not:n { \exp_not:e { \tl_head:N #1 } } }
2166   }
2167   {
2168     { \exp_not:N \__cmd_start:nNNnnn } {#2}
2169     { \exp_not:N \__cmd_start_expandable:nNNNNn } {#3}
2170     { \exp_not:N \__cmd_start_env:nnnnn } {#4}
2171     {
2172       \exp_after:wN \exp_not:N
2173       \cs:w environment~
2174       \exp_last_unbraced:Ne \use_none:nnn
2175       { \cs_to_str:N #1 } ~end~aux \cs_end:
2176     } {#5}
2177   }
2178   {#6}
2179 }
2180 \cs_new_protected:Npn \__kernel_cmd_if_xparse:NTF #1
2181 {
2182   \__cmd_cmd_type_cases:NnnnnF #1
2183   { } { } { } { } { } { \use_iii:nnn }
2184   \use_i:nn
2185 }

```

(End definition for \\_kernel\\_cmd\\_if\\_xparse:NTF, \\_cmd\\_cmd\\_type\\_cases:Nnnnn, and  
\\_cmd\\_cmd\\_if\\_xparse\\_aux:N.)

\\_cmd\\_peek\\_non\\_space:NTF Collect spaces in a loop, and put the collected spaces back in the false branch of a call  
to \peek\\_meaning:NTF or \peek\\_meaning\\_remove:NTF.

```

2186 \cs_new_protected:Npn \_cmd_peek_non_space:NTF
2187   { \_cmd_peek_non_space_aux:nNNTF { } \_cmd_peek_meaning:NTF }
2188 \cs_new_protected:Npn \_cmd_peek_non_space_remove:NTF
2189   { \_cmd_peek_non_space_aux:nNNTF { } \_cmd_peek_meaning_remove:NTF }
2190 \cs_new_protected:Npn \_cmd_peek_non_space_aux:nNNTF #1#2#3#4#5
2191   {
2192     \peek_meaning_remove:NTF \c_space_token
2193     { \_cmd_peek_non_space_aux:nNNTF { #1 ~ } #2 #3 {#4} {#5} }
2194     { #2 #3 { #4 } { #5 #1 } }
2195   }

```

(End definition for \\_cmd\\_peek\\_non\\_space:NTF, \\_cmd\\_peek\\_non\\_space\\_remove:NTF, and  
\\_cmd\\_peek\\_non\\_space\\_aux:nNNTF.)

\\_cmd\\_peek\\_meaning:NTF Peek ahead for a token with a given meaning. In case the search token is a control  
sequence, also check that the <csname> is the same as the control sequence peeked at.  
This extra verification is necessary when the command is delimited by control sequence  
tokens (as opposed to character tokens), and we want the exact same control sequence  
to match.

```

2196 \cs_new_protected:Npn \_cmd_peek_meaning:NTF
2197   { \_cmd_peek_meaning_aux:NNTF \c_false_bool }
2198 \cs_new_protected:Npn \_cmd_peek_meaning_remove:NTF
2199   { \_cmd_peek_meaning_aux:NNTF \c_true_bool }
2200 \cs_new_protected:Npn \_cmd_peek_meaning_aux:NNTF #1#2#3#4
2201   {
2202     \tl_set:Nn \l__cmd_tmpa_tl {#3}
2203     \tl_set:Nn \l__cmd_tmpb_tl {#4}
2204     \peek_meaning:NTF #2
2205     {
2206       \token_if_eq_meaning:NNTF #2 \c_group_begin_token
2207       { \_cmd_peek_true_remove:Nw #1 }
2208       {
2209         \_cmd_token_if_cs:NTF #2
2210         { \_cmd_peek_cs_check_equal:NNN #1 #2 }
2211         { \_cmd_peek_true_remove:Nw #1 }
2212       }
2213     }
2214     { \l__cmd_tmpb_tl }
2215   }
2216 \cs_new_protected:Npn \_cmd_peek_cs_check_equal:NNN #1#2#3
2217   {
2218     \str_if_eq:nnTF {#2} {#3}
2219     { \_cmd_peek_true_remove:Nw #1 }
2220     { \l__cmd_tmpb_tl }
2221     #3
2222   }
2223 \cs_new_protected:Npn \_cmd_peek_true_remove:Nw #1
2224   {
2225     \bool_if:NTF #1

```

```

2226     {
2227       \tex_afterassignment:D \l__cmd_tmpa_tl
2228       \cs_set_eq:NN \__cmd_tmp:w
2229     }
2230     { \l__cmd_tmpa_tl }
2231   }

```

(End definition for \\_\_cmd\_peek\_meaning:NTF and others.)

## 1.13 Messages

---

### \c\_\_cmd\_ignore\_def\_tl

---

```

2232 \tl_const:Nn \c__cmd_ignore_def_tl
2233 { \ \ \ LaTeX-will-ignore-this-entire-definition. }

```

\\_\_cmd\_environment\_or\_command: Two texts used in several messages.

```

2234 \cs_new:Npn \__cmd_environment_or_command:
2235 {
2236   \bool_if:NTF \l__cmd_environment_bool
2237   { environment ~ ' \l__cmd_environment_str ' }
2238   {
2239     command ~ '
2240     \exp_args:Nf \tl_trim_spaces:n
2241     { \exp_after:wN \token_to_str:N \l__cmd_fn_tl }
2242     ,
2243   }
2244 }

```

(End definition for \\_\_cmd\_environment\_or\_command:.)

Some messages intended as errors when defining commands/environments.

```

2245 \msg_new:nnnn { cmd } { arg-after-body }
2246 { Argument~type~'b'~must~be~last~in~#1. }
2247 {
2248   The~'b'~argument~type~must~come~last~but~it~is~followed~
2249   by~'#2'~in~the~argument~specification.~This~is~not~allowed.
2250   \c__cmd_ignore_def_tl
2251 }
2252 \msg_new:nnnn { cmd } { bad-arg-spec }
2253 { Bad~argument~specification~'#2'~for~#1. }
2254 {
2255   The~argument~specification~provided~is~not~valid:~
2256   one~or~more~mandatory~parts~are~missing.
2257   \c__cmd_ignore_def_tl
2258 }
2259 \msg_new:nnnn { cmd } { already-defined }
2260 { Command~'#1'~already~defined. }
2261 {
2262   You~have~used~#2~
2263   with~a~command~that~already~has~a~definition. \ \ \
2264   The~existing~definition~of~'#1'~will~not~be~altered.
2265 }
2266 \msg_new:nnnn { cmd } { undefined }

```

```

2267 { Command ~'#1'~undefined. }
2268 {
2269   You~have~used~#2~
2270   with~a~command~that~was~never~defined.
2271   \c__cmd_ignore_def_tl
2272 }
2273 \msg_new:nnnn { cmd } { env-already-defined }
2274 { Environment~'#1'~already-defined. }
2275 {
2276   You~have~used~\NewDocumentEnvironment
2277   with~an~environment~that~already~has~a~definition. \\\
2278   The~existing~definition~of~'#1'~will~not~be~altered.
2279 }
2280 \msg_new:nnnn { cmd } { env-end-already-defined }
2281 { End-of-environment~'#1'~already-defined. }
2282 {
2283   You~have~used~\NewDocumentEnvironment
2284   with~an~environment~that~already~has~a~definition~for~'end#1'. \\\
2285   The~existing~definition~of~'#1'~will~not~be~altered.
2286 }
2287 \msg_new:nnnn { cmd } { env-undefined }
2288 { Environment~'#1'~undefined. }
2289 {
2290   You~have~used~\RenewDocumentEnvironment
2291   with~an~environment~that~was~never~defined.
2292   \c__cmd_ignore_def_tl
2293 }
2294 \msg_new:nnnn { cmd } { expandable-ending-optional }
2295 { Bad~argument~specification~'#2'~for~#1. }
2296 {
2297   Expandable~commands~must~have~a~final~mandatory~argument~
2298   (or~no~arguments~at~all).~You~cannot~have~a~terminal~optional~
2299   argument~with~expandable~commands.
2300 }
2301 \msg_new:nnnn { cmd } { long-short-mix }
2302 { Invalid~argument~prefix~'+ '~in~command~'#1'. }
2303 {
2304   The~arguments~for~an~expandable~command~must~not~involve~short~
2305   arguments~after~long~arguments.~You~have~tried~to~mix~the~two~types~
2306   when~defining~'#1'.
2307 }
2308 \msg_new:nnnn { cmd } { invalid-command-arg }
2309 { Invalid~argument~type~'#2'~in~#1. }
2310 {
2311   The~letter~'#2'~can~only~be~used~in~environment~argument~
2312   specifications,~but~not~for~commands.
2313   \\\
2314   LaTeX~will~ignore~the~entire~definition.
2315 }
2316 \msg_new:nnnn { cmd } { invalid-expandable-arg }
2317 { Invalid~argument~type~'#2'~in~#1. }
2318 {
2319   The~letter~'#2'~specifies~an~argument~type~which~cannot~be~used~
2320   in~an~expandable~command.

```

```

2321 \c__cmd_ignore_def_tl
2322 }
2323 \msg_new:nnnn { cmd } { invalid-after-optional-expandably }
2324 { Argument~'#2'~invalid-after-optional-arg-in~#1. }
2325 {
2326   The~letter~'#2'~specifies~an~argument~type~which~cannot~be~used~
2327   in~an~expandable~command~after~an~optional~argument.
2328   \c__cmd_ignore_def_tl
2329 }
2330 \msg_new:nnnn { cmd } { invalid-bang }
2331 { Invalid~argument~prefix~'!'~in~#1. }
2332 {
2333   The~prefix~'!'~is~only~allowed~for~trailing~optional~arguments.~
2334   You~tried~to~apply~it~to~'#2'.
2335   \c__cmd_ignore_def_tl
2336 }
2337 \msg_new:nnnn { cmd } { not-definable }
2338 { First~argument~of~'#2'~must~be~a~command. }
2339 {
2340   The~first~argument~of~'#2'~should~be~the~document~command~that~will~
2341   be~defined.~The~provided~argument~'#1'~is~a~character.~Perhaps~a~
2342   backslash~is~missing?
2343   \c__cmd_ignore_def_tl
2344 }
2345 \msg_new:nnnn { cmd } { not-one-token }
2346 { First~argument~of~'#2'~must~be~a~command. }
2347 {
2348   The~first~argument~of~'#2'~should~be~the~document~command~that~will~
2349   be~defined.~The~provided~argument~'#1'~contains~more~than~one~
2350   token.~Perhaps~a~backslash~is~missing?
2351   \c__cmd_ignore_def_tl
2352 }
2353 \msg_new:nnnn { cmd } { not-single-token }
2354 { Argument~delimiter~'#2'~invalid~in~#1. }
2355 {
2356   The~argument~specification~contains~
2357   \tl_if_empty:nTF{#2}{nothing}{'#2'}~
2358   in~a~place~
2359   where~a~single~token~is~required.
2360   \c__cmd_ignore_def_tl
2361 }
2362 \msg_new:nnnn { cmd } { forbidden-group-token }
2363 { Argument~delimiter~'#2'~invalid~in~#1. }
2364 {
2365   The~argument~specification~contains~the~implicit~
2366   #3-group~token~'#2'~which~is~not~allowed~as~an~argument~delimiter.
2367   \c__cmd_ignore_def_tl
2368 }
2369 \msg_new:nnnn { cmd } { processor-in-expandable }
2370 { Invalid~argument~prefix~'>'~in~command~'#1'. }
2371 {
2372   The~argument~specification~for~'#1'~contains~the~processor~function~'>{#2}'~.~
2373   This~is~only~supported~for~robust~commands,~but~not~for~expandable~ones.
2374   \c__cmd_ignore_def_tl

```

```

2375 }
2376 \msg_new:nnnn { cmd } { too-many-args }
2377 { Too-many-arguments-for-#1. }
2378 {
2379   The~argument~specification~'#2'~asks~for~more~than~9~arguments.~
2380   This~cannot~be~implemented.
2381   \c__cmd_ignore_def_tl
2382 }
2383 \msg_new:nnnn { cmd } { two-markers }
2384 { Invalid~argument~prefix~'#2'~in~#1. }
2385 {
2386   The~argument~specification~provided~for~#1~has~two~'#2'~markers~applied~
2387   to~the~same~argument;~one~is~redundant.
2388 }
2389 \msg_new:nnnn { cmd } { unknown-argument-type } % should be unkown-arg-type but dep in xparse
2390 { Invalid~argument~type~'#2'~in~#1. }
2391 {
2392   The~letter~'#2'~does~not~specify~a~known~argument~type.
2393   \c__cmd_ignore_def_tl
2394 }
2395 \msg_new:nnnn { cmd } { xparse-arg-type }
2396 { Invalid~argument~type~'#2'~in~#1~(requires~xparse). }
2397 {
2398   The~letter~'#2'~specifies~a~known~but~deprecated~argument~type.~
2399   If~you~really~need~it~you~have~to~load~the~xparse~package.
2400   \c__cmd_ignore_def_tl
2401 }

```

Errors when using commands/environments. The if-boolean message is always used in expandable errors. The default-loop and missing-required messages can be expandable or not expandable.

```

2402 \msg_new:nnn { cmd } { if-boolean }
2403 { Invalid~argument~{#1}~to~\iow_char:N\\IfBoolean... }
2404 \msg_new:nnnn { cmd } { default-loop }
2405 { Circular~dependency~in~defaults~of~#1. }
2406 {
2407   The~default~values~of~two~or~more~arguments~of~the~#1~
2408   depend~on~each~other~in~a~way~that~cannot~be~resolved.
2409 }
2410 \msg_new:nnnn { cmd } { missing-required }
2411 { Required~argument~missing~for~#1. }
2412 {
2413   The~#1~expects~one~of~its~arguments~to~start~with~'#2'.~
2414   LaTeX~did~not~find~this~argument~and~will~insert~a~default~value~
2415   for~further~processing.
2416 }
2417 \msg_new:nnnn { cmd } { non-xparse }
2418 { \str_uppercase:n #1~not~defined~using~xparse. }
2419 {
2420   You~have~asked~for~the~argument~specification~for~the~#1,~
2421   but~this~was~not~defined~using~xparse.
2422 }
2423 \msg_new:nnnn { cmd } { arg-split }
2424 { Too~many~'#1'~separators~in~argument. }

```

```

2425 {
2426   LaTeX~was~asked~to~split~the~input~'#3'~
2427   at~each~occurrence~of~the~separator~'#1'~into~#2~parts.~
2428   Too~many~separators~were~found.
2429 }
2430 \msg_new:nnnn { cmd } { unknown }
2431 { Unknown~document~#1. }
2432 {
2433   You~have~asked~for~the~argument~specification~for~the~#1,~
2434   but~it~is~not~defined.
2435 }
2436 \msg_new:nnnn { cmd } { verbatim-nl }
2437 { Verbatim~like~#1~ended~by~end~of~line. }
2438 {
2439   The~verbatim~argument~of~the~#1~cannot~contain~more~than~one~line,~
2440   but~the~end~
2441   of~the~current~line~has~been~reached.~You~may~have~forgotten~the~
2442   closing~delimiter.
2443   \\ \\
2444   LaTeX~will~ignore~'#2'~and~you~may~get~some~additional~
2445   (low-level)~errors.
2446 }
2447 \msg_new:nnnn { cmd } { verbatim-tokenized }
2448 { Verbatim~like~#1~illegal~in~argument. }
2449 {
2450   The~#1~takes~a~verbatim~argument~and~should~therefore~normally~
2451   not~be~used~in~arguments~of~other~commands~or~environments.~
2452   LaTeX~found~an~illegal~token~ \tl_if_empty:nF {#3} { (#3)~ }
2453   after~'#2'~and~will~drop~everything~up~to~this~point.
2454   \\ \\
2455   Expect~further~(low-level)~errors.
2456 }
2457 \msg_new:nnn { cmd } { define-command } % should be just 'define' but dep in xparse
2458 {
2459   Defining~command~#1~
2460   with~sig.~'#2'~\msg_line_context:.
2461 }
2462 \msg_new:nnn { cmd } { define-env }
2463 {
2464   Defining~environment~'#1'~
2465   with~sig.~'#2'~\msg_line_context:.
2466 }
2467 \msg_new:nnn { cmd } { redefine }
2468 {
2469   Redefining~command~#1~
2470   with~sig.~'#2'~\msg_line_context:.
2471 }
2472 \msg_new:nnn { cmd } { redefine-env }
2473 {
2474   Redefining~environment~'#1'~
2475   with~sig.~'#2'~\msg_line_context:.
2476 }
2477 \msg_new:nnn { cmd } { optional-mandatory }

```

```

2478 {
2479   Optional~and~mandatory~argument~with~same~delimiter~'#2'.
2480   \\ \\
2481   The~mandatory~argument~specified~with~
2482   '\str_case:nnF{#1}{ {R/r}{r'~or~'R} }{#1}'~has~the~
2483   same~delimiter~'#2'~as~an~earlier~optional~argument.~
2484   It~will~therefore~not~be~possible~to~omit~all~the~earlier~
2485   optional~arguments~when~calling~this~command.
2486   \\ \\
2487   This~may~be~intentional,~but~then~it~might~be~a~mistake.
2488 }
2489 \msg_new:nnn { cmd } { unsupported-let }
2490 {
2491   The~command~'#1'~was~undefined~but~not~the~associated~commands~
2492   '#1~code'~and/or~'#1~defaults'.~Maybe~you~tried~using~
2493   \low_char:N\let.~This~may~lead~to~an~infinite~loop.
2494 }

```

## 1.14 User functions

The user functions are more or less just the internal functions renamed.

`\BooleanFalse` Design-space names for the Boolean values.

`\BooleanTrue` 2495 `\cs_new_eq:NN \BooleanFalse \c_false_bool`  
 2496 `\cs_new_eq:NN \BooleanTrue \c_true_bool`

(End definition for `\BooleanFalse` and `\BooleanTrue`.)

`\NewDocumentCommand`  
`\RenewDocumentCommand`  
`\ProvideDocumentCommand`  
`\DeclareDocumentCommand`

The user macros are pretty simple wrappers around the internal ones. There is however a check that the first argument is a single token, possibly surrounded by spaces (hence the strange `\use:nnn`), and is definable.

```

2497 \cs_new_protected:Npn \NewDocumentCommand #1#2#3
2498 {
2499   \__cmd_check_definable:nNT {#1} \NewDocumentCommand
2500   {
2501     \cs_if_exist:NTF #1
2502     {
2503       \msg_error:nxxx { cmd } { already-defined }
2504       { \use:nnn \token_to_str:N #1 { } }
2505       { \token_to_str:N \NewDocumentCommand }
2506     }
2507     { \__cmd_declare_cmd:Nnn #1 {#2} {#3} }
2508   }
2509 }
2510 \cs_new_protected:Npn \RenewDocumentCommand #1#2#3
2511 {
2512   \__cmd_check_definable:nNT {#1} \RenewDocumentCommand
2513   {
2514     \cs_if_exist:NTF #1
2515     { \__cmd_declare_cmd:Nnn #1 {#2} {#3} }
2516     {
2517       \msg_error:nxxx { cmd } { undefined }
2518       { \use:nnn \token_to_str:N #1 { } }
2519       { \token_to_str:N \RenewDocumentCommand }

```



```

2520     }
2521   }
2522 }
2523 \cs_new_protected:Npn \ProvideDocumentCommand #1#2#3
2524 {
2525   \__cmd_check_definable:nNT {#1} \ProvideDocumentCommand
2526   { \cs_if_exist:NF #1 { \__cmd_declare_cmd:Nnn #1 {#2} {#3} } }
2527 }
2528 \cs_new_protected:Npn \DeclareDocumentCommand #1#2#3
2529 {
2530   \__cmd_check_definable:nNT {#1} \DeclareDocumentCommand
2531   { \__cmd_declare_cmd:Nnn #1 {#2} {#3} }
2532 }

```

(End definition for \NewDocumentCommand and others.)

<pre> \NewDocumentEnvironment \RenewDocumentEnvironment \ProvideDocumentEnvironment \DeclareDocumentEnvironment </pre>	<p>Very similar for environments.</p> <pre> 2533 \cs_new_protected:Npn \NewDocumentEnvironment #1#2#3#4 2534 { 2535   \cs_if_exist:cTF {#1} 2536   { \msg_error:nnx { cmd } { env-already-defined } {#1} } 2537   { 2538     \cs_if_exist:cTF { end #1 } 2539     { \msg_error:nnx { cmd } { env-end-already-defined } {#1} } 2540     { \__cmd_declare_env:nnnn {#1} {#2} {#3} {#4} } 2541   } 2542 } 2543 \cs_new_protected:Npn \RenewDocumentEnvironment #1#2#3#4 2544 { 2545   \cs_if_exist:cTF {#1} 2546   { \__cmd_declare_env:nnnn {#1} {#2} {#3} {#4} } 2547   { \msg_error:nnx { cmd } { env-undefined } {#1} } 2548 } 2549 \cs_new_protected:Npn \ProvideDocumentEnvironment #1#2#3#4 2550 { \cs_if_exist:cF {#1} { \__cmd_declare_env:nnnn {#1} {#2} {#3} {#4} } } 2551 \cs_new_protected:Npn \DeclareDocumentEnvironment #1#2#3#4 2552 { \__cmd_declare_env:nnnn {#1} {#2} {#3} {#4} } </pre>
--	---

(End definition for \NewDocumentEnvironment and others.)

<pre> \NewExpandableDocumentCommand \RenewExpandableDocumentCommand \ProvideExpandableDocumentCommand \DeclareExpandableDocumentCommand </pre>	<p>The expandable versions are essentially the same as the basic functions. The strange <code>\use:nnn</code> is there in case <code>#1</code> is surrounded with spaces, as can happen with usual document catcodes in <code>\RenewExpandableDocumentCommand { \! } ...</code></p> <pre> 2553 \cs_new_protected:Npn \NewExpandableDocumentCommand #1#2#3 2554 { 2555   \__cmd_check_definable:nNT {#1} \NewExpandableDocumentCommand 2556   { 2557     \cs_if_exist:NTF #1 2558     { 2559       \msg_error:nnxx { cmd } { already-defined } 2560       { \use:nnn \token_to_str:N #1 { } } 2561       { \token_to_str:N \NewExpandableDocumentCommand } 2562     } 2563     { \__cmd_declare_expandable_cmd:Nnn #1 {#2} {#3} } </pre>
--	---

```

2564     }
2565   }
2566   \cs_new_protected:Npn \RenewExpandableDocumentCommand #1#2#3
2567   {
2568     \__cmd_check_definable:nNT {#1} \RenewExpandableDocumentCommand
2569     {
2570       \cs_if_exist:NTF #1
2571       { \__cmd_declare_expandable_cmd:Nnn #1 {#2} {#3} }
2572       {
2573         \msg_error:nnxx { cmd } { undefined }
2574         { \use:nnn \token_to_str:N #1 { } }
2575         { \token_to_str:N \RenewExpandableDocumentCommand }
2576       }
2577     }
2578   }
2579   \cs_new_protected:Npn \ProvideExpandableDocumentCommand #1#2#3
2580   {
2581     \__cmd_check_definable:nNT {#1} \ProvideExpandableDocumentCommand
2582     {
2583       \cs_if_exist:NF #1
2584       { \__cmd_declare_expandable_cmd:Nnn #1 {#2} {#3} }
2585     }
2586   }
2587   \cs_new_protected:Npn \DeclareExpandableDocumentCommand #1#2#3
2588   {
2589     \__cmd_check_definable:nNT {#1} \DeclareExpandableDocumentCommand
2590     { \__cmd_declare_expandable_cmd:Nnn #1 {#2} {#3} }
2591   }

```

(End definition for `\NewExpandableDocumentCommand` and others.)

`\IfBooleanT` The logical `<true>` and `<false>` statements are just the normal `\c_true_bool` and `\c_false_bool` so `\bool_if:NNTF` is almost enough. However, this code-level function blows up badly when passed invalid input. We want `\IfBooleanTF` to accept a single (non-space) token equal to `\c_true_bool` or `\c_false_bool`, possibly surrounded by spaces. If the input is blank or multiple items, jump to the error and pick the false branch. If the input, ignoring spaces (we do this by omitting braces in the `\tl_if_single_token:nF` test), is not a single token then jump to the error as well. It is then safe to compare the token to the two booleans, picking the appropriate branch. If neither matches, we jump to the error as well.

```

2592   \cs_new:Npn \IfBooleanTF #1
2593   {
2594     \tl_if_single:nF {#1}
2595     { \prg_break:n { \use:n } }
2596     \tl_if_single_token:nF #1
2597     { \prg_break:n { \use:n } }
2598     \token_if_eq_meaning:NNT #1 \c_true_bool
2599     { \prg_break:n { \use_ii:nnn } }
2600     \token_if_eq_meaning:NNT #1 \c_false_bool
2601     { \prg_break:n { \use_iii:nnn } }
2602     \prg_break:n { \use:n }
2603     \prg_break_point:
2604     {
2605       \msg_expandable_error:nnn { cmd } { if-boolean } {#1}

```

```

2606         \use_ii:nn
2607     }
2608 }
2609 \cs_new:Npn \IfBooleanT #1#2 { \IfBooleanTF {#1} {#2} { } }
2610 \cs_new:Npn \IfBooleanF #1 { \IfBooleanTF {#1} { } }

```

(End definition for `\IfBooleanT`, `\IfBooleanF`, and `\IfBooleanTF`.)

`\IfNoValueT` Simple re-naming.

```

\IfNoValueF 2611 \cs_new_eq:NN \IfNoValueF \tl_if_novalue:nF
\IfNoValueTF 2612 \cs_new_eq:NN \IfNoValueT \tl_if_novalue:nT
2613 \cs_new_eq:NN \IfNoValueTF \tl_if_novalue:nTF

```

(End definition for `\IfNoValueT`, `\IfNoValueF`, and `\IfNoValueTF`.)

`\IfValueT` Inverted logic.

```

\IfValueF 2614 \cs_new:Npn \IfValueF { \tl_if_novalue:nT }
\IfValueTF 2615 \cs_new:Npn \IfValueT { \tl_if_novalue:nF }
2616 \cs_new:Npn \IfValueTF #1#2#3 { \tl_if_novalue:nTF {#1} {#3} {#2} }

```

(End definition for `\IfValueT`, `\IfValueF`, and `\IfValueTF`.)

`\IfBlankT` Another simple re-naming.

```

\IfBlankF 2617 <latexrelease> \IncludeInRelease{2022/06/01}%
\IfBlankTF 2618 <latexrelease> { \IfBlankTF } { Testing~for~empty~or~blank } %
2619 \cs_new_eq:NN \IfBlankF \tl_if_blank:nF
2620 \cs_new_eq:NN \IfBlankT \tl_if_blank:nT
2621 \cs_new_eq:NN \IfBlankTF \tl_if_blank:nTF
2622 <latexrelease> \EndIncludeInRelease
2623 <latexrelease> \IncludeInRelease{2021/11/15}%
2624 <latexrelease> { \IfBlankTF } { Testing~for~empty~or~blank } %
2625 <latexrelease> \cs_undefine:N \IfBlankF
2626 <latexrelease> \cs_undefine:N \IfBlankT
2627 <latexrelease> \cs_undefine:N \IfBlankTF
2628 <latexrelease>
2629 <latexrelease> \EndIncludeInRelease

```

(End definition for `\IfBlankT`, `\IfBlankF`, and `\IfBlankTF`.)

`\ProcessedArgument` Processed arguments are returned using this name, which is reserved here although the definition will change.

```
2630 \tl_new:N \ProcessedArgument
```

(End definition for `\ProcessedArgument`.)

`\ReverseBoolean` Simple copies.

```

\SplitArgument 2631 \cs_new_eq:NN \ReverseBoolean \__cmd_bool_reverse:N
\SplitList 2632 \cs_new_eq:NN \SplitArgument \__cmd_split_argument:nnn
\TrimSpaces 2633 \cs_new_eq:NN \SplitList \__cmd_split_list:nn
2634 \cs_new_eq:NN \TrimSpaces \__cmd_trim_spaces:n

```

(End definition for `\ReverseBoolean` and others.)

`\ProcessList` To support `\SplitList`.

```
2635 \cs_new_eq:NN \ProcessList \tl_map_function:nN
```

(End definition for \ProcessList.)

\GetDocumentCommandArgSpec \GetDocumentEnvironmentArgSpec  
 \ShowDocumentCommandArgSpec \ShowDocumentEnvironmentArgSpec

More simple mappings, with a check that the argument is a single control sequence or active character.

```

2636 \cs_new_protected:Npn \GetDocumentCommandArgSpec #1
2637 {
2638   \__cmd_check_definable:nNT {#1} \GetDocumentCommandArgSpec
2639   { \__cmd_get_arg_spec:N #1 }
2640 }
2641 \cs_new_eq:NN \GetDocumentEnvironmentArgSpec \__cmd_get_arg_spec:n
2642 \cs_new_protected:Npn \ShowDocumentCommandArgSpec #1
2643 {
2644   \__cmd_check_definable:nNT {#1} \ShowDocumentCommandArgSpec
2645   { \__cmd_show_arg_spec:N #1 }
2646 }
2647 \cs_new_eq:NN \ShowDocumentEnvironmentArgSpec \__cmd_show_arg_spec:n

```

(End definition for \GetDocumentCommandArgSpec and others.)

Finally as promised, restore \\_\_kernel\_chk\_if\_free\_cs:N:

```

2648 \latexrelease\cs_gset_eq:NN \__kernel_chk_if_free_cs:N \__cmd_chk_if_free_cs:N
2649 \latexrelease\cs_undefine:N \__cmd_chk_if_free_cs:N
2650 \latexrelease
2651 \latexrelease\IncludeInRelease{0000/00/00}{\ltxcmd}%
2652 \latexrelease{Document~command~parser}%
2653 \latexrelease
2654 \latexrelease\EndModuleRelease
2655 \ExplSyntaxOff

```

Now in latexrelease mode, redefine \NewDocumentCommand to not complain on commands already defined.

```

2656 \latexrelease\@ifundefined{ExplSyntaxOff}{\{\latexrelease@postltxcmd\}
2657 \latexrelease\catcode'\^^@=\@latexrelease@catcode@null\relax
2658 \>2ekernel|latexrelease\

```

We need to stop DocStrip treating @@ in a special way at this point.

```

2659 \@@=

```

# File h

## lthooks.dtx

### 1 Introduction

Hooks are points in the code of commands or environments where it is possible to add processing code into existing commands. This can be done by different packages that do not know about each other and to allow for hopefully safe processing it is necessary to sort different chunks of code added by different packages into a suitable processing order.

This is done by the packages adding chunks of code (via `\AddToHook`) and labeling their code with some label by default using the package name as a label.

At `\begin{document}` all code for a hook is then sorted according to some rules (given by `\DeclareHookRule`) for fast execution without processing overhead. If the hook code is modified afterwards (or the rules are changed), a new version for fast processing is generated.

Some hooks are used already in the preamble of the document. If that happens then the hook is prepared for execution (and sorted) already at that point.

### 2 Package writer interface

The hook management system is offered as a set of CamelCase commands for traditional  $\text{\LaTeX 2}_{\epsilon}$  packages (and for use in the document preamble if needed) as well as `expl3` commands for modern packages, that use the L3 programming layer of  $\text{\LaTeX}$ . Behind the scenes, a single set of data structures is accessed so that packages from both worlds can coexist and access hooks in other packages.

#### 2.1 $\text{\LaTeX 2}_{\epsilon}$ interfaces

##### 2.1.1 Declaring hooks

With a few exceptions, hooks have to be declared before they can be used. The exceptions are the generic hooks for commands and environments (executed at `\begin` and `\end`), and the hooks run when loading files (see section 3.1).

---

<code>\NewHook</code>	<code>\NewHook {&lt;hook&gt;}</code>
-----------------------	--------------------------------------

---

Creates a new `<hook>`. If this hook is declared within a package it is suggested that its name is always structured as follows: `<package-name>/<hook-name>`. If necessary you can further subdivide the name by adding more `/` parts. If a hook name is already taken, an error is raised and the hook is not created.

The `<hook>` can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

---

<code>\NewReversedHook</code>	<code>\NewReversedHook {&lt;hook&gt;}</code>
-------------------------------	--

---

Like `\NewHook` declares a new `<hook>`. the difference is that the code chunks for this hook are in reverse order by default (those added last are executed first). Any rules for the hook are applied after the default ordering. See sections 2.3 and 2.4 for further details.

The `<hook>` can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

---

<code>\NewMirroredHookPair</code>	<code>\NewMirroredHookPair {&lt;hook-1&gt;} {&lt;hook-2&gt;}</code>
-----------------------------------	---

---

A shorthand for `\NewHook{<hook-1>}\NewReversedHook{<hook-2>}`.

The `<hooks>` can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

### 2.1.2 Special declarations for generic hooks

The declarations here should normally not be used. They are available to provide support for special use cases mainly involving generic command hooks.

---

<code>\DisableGenericHook</code>	<code>\DisableGenericHook {&lt;hook&gt;}</code>
----------------------------------	---

---

After this declaration<sup>3</sup> the `<hook>` is no longer usable: Any attempt to add further code to it will result in an error and any use, e.g., via `\UseHook`, will simply do nothing.

This is intended to be used with generic command hooks (see `lthcmdhooks-doc`) as depending on the definition of the command such generic hooks may be unusable. If that is known, a package developer can disable such hooks up front.

The `<hook>` can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

---

<code>\ActivateGenericHook</code>	<code>\ActivateGenericHook {&lt;hook&gt;}</code>
-----------------------------------	--

---

This declaration activates a generic hook provided by a package/class (e.g., one used in code with `\UseHook` or `\UseOneTimeHook`) without it being explicitly declared with `\NewHook`). This command undoes the effect of `\DisableGenericHook`. If the hook is already activated, this command does nothing.

See section 2.6 for a discussion of when this declaration is appropriate.

### 2.1.3 Using hooks in code

---

<code>\UseHook</code>	<code>\UseHook {&lt;hook&gt;}</code>
-----------------------	--------------------------------------

---

Execute the hook code inside a command or environment.

Before `\begin{document}` the fast execution code for a hook is not set up, so in order to use a hook there it is explicitly initialized first. As that involves assignments using a hook at those times is not 100% the same as using it after `\begin{document}`.

The `<hook>` *cannot* be specified using the dot-syntax. A leading `.` is treated literally.

---

<sup>3</sup>In the 2020/06 release this command was called `\DisableHook`, but that name was misleading as it shouldn't be used to disable non-generic hooks.

---

<code>\UseOneTimeHook</code>	<code>\UseOneTimeHook {&lt;hook&gt;}</code>
------------------------------	---

---

Some hooks are only used (and can be only used) in one place, for example, those in `\begin{document}` or `\end{document}`. Once we have passed that point adding to the hook through a defined `\<addto-cmd>` command (e.g., `\AddToHook` or `\AtBeginDocument`, etc.) would have no effect (as would the use of such a command inside the hook code itself). It is therefore customary to redefine `\<addto-cmd>` to simply process its argument, i.e., essentially make it behave like `\@firstofone`.

`\UseOneTimeHook` does that: it records that the hook has been consumed and any further attempt to add to it will result in executing the code to be added immediately.

The `<hook>` *cannot* be specified using the dot-syntax. A leading `.` is treated literally. See section 2.1.5 for details.

Using `\UseOneTimeHook` several times with the same `{<hook>}` means that it only executes the first time it is used. For example, if it is used in a command that can be called several times then the hook executes during only the *first* invocation of that command; this allows its use as an “initialization hook”.

Mixing `\UseHook` and `\UseOneTimeHook` for the same `{<hook>}` should be avoided, but if this is done then neither will execute after the first `\UseOneTimeHook`.

#### 2.1.4 Updating code for hooks

---

<code>\AddToHook</code>	<code>\AddToHook {&lt;hook&gt;}[&lt;label&gt;]{&lt;code&gt;}</code>
-------------------------	---

---

Adds `<code>` to the `<hook>` labeled by `<label>`. When the optional argument `<label>` is not provided, the `<default label>` is used (see section 2.1.5). If `\AddToHook` is used in a package/class, the `<default label>` is the package/class name, otherwise it is `top-level` (the `top-level` label is treated differently: see section 2.1.6).

If there already exists code under the `<label>` then the new `<code>` is appended to the existing one (even if this is a reversed hook). If you want to replace existing code under the `<label>`, first apply `\RemoveFromHook`.

The hook doesn’t have to exist for code to be added to it. However, if it is not declared, then obviously the added `<code>` will never be executed. This allows for hooks to work regardless of package loading order and enables packages to add to hooks from other packages without worrying whether they are actually used in the current document. See section 2.1.8.

The `<hook>` and `<label>` can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

---

<code>\RemoveFromHook</code>	<code>\RemoveFromHook {&lt;hook&gt;}[&lt;label&gt;]</code>
------------------------------	--

---

Removes any code labeled by `<label>` from the `<hook>`. When the optional argument `<label>` is not provided, the `<default label>` is used (see section 2.1.5).

If there is no code under the `<label>` in the `<hook>`, or if the `<hook>` does not exist, a warning is issued when you attempt to `\RemoveFromHook`, and the command is ignored. `\RemoveFromHook` should be used only when you know exactly what labels are in a hook. Typically this will be when some code gets added to a hook by a package, then later this code is removed by that same package. If you want to prevent the execution of code from another package, use the `voids` rule instead (see section 2.1.7).

If the optional `<label>` argument is `*`, then all code chunks are removed. This is rather dangerous as it may well drop code from other packages (that one may not know about); it should therefore not be used in packages but only in document preambles!

The `<hook>` and `<label>` can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

In contrast to the `voids` relationship between two labels in a `\DeclareHookRule` this is a destructive operation as the labeled code is removed from the hook data structure, whereas the relationship setting can be undone by providing a different relationship later.

A useful application for this declaration inside the document body is when one wants to temporarily add code to hooks and later remove it again, e.g.,

```
\AddToHook{env/quote/before}{\small}
\begin{quote}
  A quote set in a smaller typeface
\end{quote}
...
\RemoveFromHook{env/quote/before}
... now back to normal for further quotes
```

Note that you can't cancel the setting with

```
\AddToHook{env/quote/before}{}
```

because that only “adds” a further empty chunk of code to the hook. Adding `\normalsize` would work but that means the hook then contained `\small\normalsize` which means two font size changes for no good reason.

The above is only needed if one wants to typeset several quotes in a smaller typeface. If the hook is only needed once then `\AddToHookNext` is simpler, because it resets itself after one use.



---

**\AddToHookNext**    `\AddToHookNext {<hook>}{<code>}`

---

Adds `<code>` to the next invocation of the `<hook>`. The code is executed after the normal hook code has finished and it is executed only once, i.e. it is deleted after it was used.

Using this declaration is a global operation, i.e., the code is not lost even if the declaration is used inside a group and the next invocation of the hook happens after the end of that group. If the declaration is used several times before the hook is executed then all code is executed in the order in which it was declared.<sup>4</sup>

If this declaration is used with a one-time hook then the code is only ever used if the declaration comes before the hook’s invocation. This is because, in contrast to `\AddToHook`, the code in this declaration is not executed immediately in the case when the invocation of the hook has already happened—in other words, this code will truly execute only on the next invocation of the hook (and in the case of a one-time hook there is no such “next invocation”). This gives you a choice: should my code execute always, or should it execute only at the point where the one-time hook is used (and not at all if this is impossible)? For both of these possibilities there are use cases.

It is possible to nest this declaration using the same hook (or different hooks): e.g.,

`\AddToHookNext{<hook>}{<code-1>\AddToHookNext{<hook>}{<code-2>}}`

will execute `<code-1>` next time the `<hook>` is used and at that point puts `<code-2>` into the `<hook>` so that it gets executed on following time the hook is run.

A hook doesn’t have to exist for code to be added to it. This allows for hooks to work regardless of package loading order. See section 2.1.8.

The `<hook>` can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

---

**\ClearHookNext**    `\ClearHookNext{<hook>}`

---

Normally `\AddToHookNext` is only used when you know precisely where it will apply and why you want some extra code at that point. However, there are a few use cases in which such a declaration needs to be canceled, for example, when discarding a page with `\DiscardShipoutBox` (but even then not always), and in such situations `\ClearHookNext` can be used.

### 2.1.5 Hook names and default labels

It is best practice to use `\AddToHook` in packages or classes *without specifying a <label>* because then the package or class name is automatically used, which is helpful if rules are needed, and avoids mistyping the `<label>`.

Using an explicit `<label>` is only necessary in very specific situations, e.g., if you want to add several chunks of code into a single hook and have them placed in different parts of the hook (by providing some rules).

The other case is when you develop a larger package with several sub-packages. In that case you may want to use the same `<label>` throughout the sub-packages in order to avoid that the labels change if you internally reorganize your code.

Except for `\UseHook`, `\UseOneTimeHook` and `\IfHookEmptyTF` (and their `expl3` interfaces `\hook_use:n`, `\hook_use_once:n` and `\hook_if_empty:nTF`), all `<hook>` and `<label>` arguments are processed in the same way: first, spaces are trimmed around the argument, then it is fully expanded until only character tokens remain. If the full expansion

---

<sup>4</sup>There is no mechanism to reorder such code chunks (or delete them).

of the  $\langle hook \rangle$  or  $\langle label \rangle$  contains a non-expandable non-character token, a low-level T<sub>E</sub>X error is raised (namely, the  $\langle hook \rangle$  is expanded using T<sub>E</sub>X’s `\csname...\endcsname`, as such, Unicode characters are allowed in  $\langle hook \rangle$  and  $\langle label \rangle$  arguments). The arguments of `\UseHook`, `\UseOneTimeHook`, and `\IfHookEmptyTF` are processed much in the same way except that spaces are not trimmed around the argument, for better performance.

It is not enforced, but highly recommended that the hooks defined by a package, and the  $\langle labels \rangle$  used to add code to other hooks contain the package name to easily identify the source of the code chunk and to prevent clashes. This should be the standard practice, so this hook management code provides a shortcut to refer to the current package in the name of a  $\langle hook \rangle$  and in a  $\langle label \rangle$ . If the  $\langle hook \rangle$  name or the  $\langle label \rangle$  consist just of a single dot (`.`), or starts with a dot followed by a slash (`./`) then the dot denotes the  $\langle default label \rangle$  (usually the current package or class name—see `\SetDefaultHookLabel`). A “.” or “./” anywhere else in a  $\langle hook \rangle$  or in  $\langle label \rangle$  is treated literally and is not replaced.

For example, inside the package `mypackage.sty`, the default label is `mypackage`, so the instructions:

```
\NewHook    {./hook}
\AddToHook  {./hook}[.]{code}      % Same as \AddToHook{./hook}{code}
\AddToHook  {./hook}[./sub]{code}
\DeclareHookRule{begindocument}{.}{before}{babel}
\AddToHook  {file/foo.tex/after}{code}
```

are equivalent to:

```
\NewHook    {mypackage/hook}
\AddToHook  {mypackage/hook}[mypackage]{code}
\AddToHook  {mypackage/hook}[mypackage/sub]{code}
\DeclareHookRule{begindocument}{mypackage}{before}{babel}
\AddToHook  {file/foo.tex/after}{code} % unchanged
```

The  $\langle default label \rangle$  is automatically set equal to the name of the current package or class at the time the package is loaded. If the hook command is used outside of a package, or the current file wasn’t loaded with `\usepackage` or `\documentclass`, then the `top-level` is used as the  $\langle default label \rangle$ . This may have exceptions—see `\PushDefaultHookLabel`.

This syntax is available in all  $\langle label \rangle$  arguments and most  $\langle hook \rangle$  arguments, both in the L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> interface, and the L<sup>A</sup>T<sub>E</sub>X 3 interface described in section 2.2.

Note, however, that the replacement of `.` by the  $\langle default label \rangle$  takes place when the hook command is executed, so actions that are somehow executed after the package ends will have the wrong  $\langle default label \rangle$  if the dot-syntax is used. For that reason, this syntax is not available in `\UseHook` (and `\hook_use:n`) because the hook is most of the time used outside of the package file in which it was defined. This syntax is also not available in the hook conditionals `\IfHookEmptyTF` (and `\hook_if_empty:nTF`), because these conditionals are used in some performance-critical parts of the hook management code, and because they are usually used to refer to other package’s hooks, so the dot-syntax doesn’t make much sense.

In some cases, for example in large packages, one may want to separate it in logical parts, but still use the main package name as  $\langle label \rangle$ , then the  $\langle default label \rangle$  can be set using `\SetDefaultHookLabel` or `\PushDefaultHookLabel{.}...\PopDefaultHookLabel`.

---

<code>\PushDefaultHookLabel</code>	<code>\PushDefaultHookLabel {⟨default label⟩}</code>
<code>\PopDefaultHookLabel</code>	<code>⟨code⟩</code>
	<code>\PopDefaultHookLabel</code>

---

`\PushDefaultHookLabel` sets the current *⟨default label⟩* to be used in *⟨label⟩* arguments, or when replacing a leading “.” (see above). `\PopDefaultHookLabel` reverts the *⟨default label⟩* to its previous value.

Inside a package or class, the *⟨default label⟩* is equal to the package or class name, unless explicitly changed. Everywhere else, the *⟨default label⟩* is **top-level** (see section 2.1.6) unless explicitly changed.

The effect of `\PushDefaultHookLabel` holds until the next `\PopDefaultHookLabel`. `\usepackage` (and `\RequirePackage` and `\documentclass`) internally use

```

\PushDefaultHookLabel{⟨package name⟩}
  ⟨package code⟩
\PopDefaultHookLabel

```

to set the *⟨default label⟩* for the package or class file. Inside the *⟨package code⟩* the *⟨default label⟩* can also be changed with `\SetDefaultHookLabel`. `\input` and other file input-related commands from the L<sup>A</sup>T<sub>E</sub>X kernel do not use `\PushDefaultHookLabel`, so code within files loaded by these commands does *not* get a dedicated *⟨label⟩*! (that is, the *⟨default label⟩* is the current active one when the file was loaded.)

Packages that provide their own package-like interfaces (TikZ’s `\usetikzlibrary`, for example) can use `\PushDefaultHookLabel` and `\PopDefaultHookLabel` to set dedicated labels and to emulate `\usepackage`-like hook behavior within those contexts.

The **top-level** label is treated differently, and is reserved to the user document, so it is not allowed to change the *⟨default label⟩* to **top-level**.

---

<code>\SetDefaultHookLabel</code>	<code>\SetDefaultHookLabel {⟨default label⟩}</code>
-----------------------------------	---

---

Similarly to `\PushDefaultHookLabel`, sets the current *⟨default label⟩* to be used in *⟨label⟩* arguments, or when replacing a leading “.”. The effect holds until the label is changed again or until the next `\PopDefaultHookLabel`. The difference between `\PushDefaultHookLabel` and `\SetDefaultHookLabel` is that the latter does not save the current *⟨default label⟩*.

This command is useful when a large package is composed of several smaller packages, but all should have the same *⟨label⟩*, so `\SetDefaultHookLabel` can be used at the beginning of each package file to set the correct label.

`\SetDefaultHookLabel` is not allowed in the main document, where the *⟨default label⟩* is **top-level** and there is no `\PopDefaultHookLabel` to end its effect. It is also not allowed to change the *⟨default label⟩* to **top-level**.

### 2.1.6 The top-level label

The **top-level** label, assigned to code added from the main document, is different from other labels. Code added to hooks (usually `\AtBeginDocument`) in the preamble is almost always to change something defined by a package, so it should go at the very end of the hook.

Therefore, code added in the **top-level** is always executed at the end of the hook, regardless of where it was declared. If the hook is reversed (see `\NewReversedHook`), the **top-level** chunk is executed at the very beginning instead.

Rules regarding `top-level` have no effect: if a user wants to have a specific set of rules for a code chunk, they should use a different label to said code chunk, and provide a rule for that label instead.

The `top-level` label is exclusive for the user, so trying to add code with that label from a package results in an error.

### 2.1.7 Defining relations between hook code

The default assumption is that code added to hooks by different packages are independent and the order in which they are executed is irrelevant. While this is true in many cases it is obviously false in others.

Before the hook management system was introduced packages had to take elaborate precaution to determine if some other package got loaded as well (before or after) and find some ways to alter its behavior accordingly. In addition it was often the user's responsibility to load packages in the right order so that code added to hooks got added in the right order and some cases even altering the loading order wouldn't resolve the conflicts.

With the new hook management system it is now possible to define rules (i.e., relationships) between code chunks added by different packages and explicitly describe in which order they should be processed.

---

**`\DeclareHookRule`** `\DeclareHookRule {<hook>}{<label1>}{<relation>}{<label2>}`

---

Defines a relation between `<label1>` and `<label2>` for a given `<hook>`. If `<hook>` is `??` this defines a default relation for all hooks that use the two labels, i.e., that have chunks of code labeled with `<label1>` and `<label2>`. Rules specific to a given hook take precedence over default rules that use `??` as the `<hook>`.

Currently, the supported relations are the following:

**`before`** or **`<`** Code for `<label1>` comes before code for `<label2>`.

**`after`** or **`>`** Code for `<label1>` comes after code for `<label2>`.

**`incompatible-warning`** Only code for either `<label1>` or `<label2>` can appear for that hook (a way to say that two packages—or parts of them—are incompatible). A warning is raised if both labels appear in the same hook.

**`incompatible-error`** Like **`incompatible-error`** but instead of a warning a `LATEX` error is raised, and the code for both labels are dropped from that hook until the conflict is resolved.

**`voids`** Code for `<label1>` overwrites code for `<label2>`. More precisely, code for `<label2>` is dropped for that hook. This can be used, for example if one package is a superset in functionality of another one and therefore wants to undo code in some hook and replace it with its own version.

**`unrelated`** The order of code for `<label1>` and `<label2>` is irrelevant. This rule is there to undo an incorrect rule specified earlier.

There can only be a single relation between two labels for a given hook, i.e., a later `\DeclareHookrule` overwrites any previous declaration.

The `<hook>` and `<label>` can be specified using the dot-syntax to denote the current package name. See section [2.1.5](#).

---

<code>\ClearHookRule</code>	<code>\ClearHookRule{&lt;hook&gt;}{&lt;label1&gt;}{&lt;label2&gt;}</code>
-----------------------------	---

---

Syntactic sugar for saying that `<label1>` and `<label2>` are unrelated for the given `<hook>`.

---

<code>\DeclareDefaultHookRule</code>	<code>\DeclareDefaultHookRule{&lt;label1&gt;}{&lt;relation&gt;}{&lt;label2&gt;}</code>
--------------------------------------	--

---

This sets up a relation between `<label1>` and `<label2>` for all hooks unless overwritten by a specific rule for a hook. Useful for cases where one package has a specific relation to some other package, e.g., is `incompatible` or always needs a special ordering `before` or `after`. (Technically it is just a shorthand for using `\DeclareHookRule` with `??` as the hook name.)

Declaring default rules is only supported in the document preamble.<sup>5</sup>

The `<label>` can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

### 2.1.8 Querying hooks

Simpler data types, like token lists, have three possible states; they can:

- exist and be empty;
- exist and be non-empty; and
- not exist (in which case emptiness doesn't apply);

Hooks are a bit more complicated: a hook may exist or not, and independently it may or may not be empty. This means that even a hook that doesn't exist may be non-empty and it can also be disabled.

This seemingly strange state may happen when, for example, package *A* defines hook `A/foo`, and package *B* adds some code to that hook. However, a document may load package *B* before package *A*, or may not load package *A* at all. In both cases some code is added to hook `A/foo` without that hook being defined yet, thus that hook is said to be non-empty, whereas it doesn't exist. Therefore, querying the existence of a hook doesn't imply its emptiness, neither does the other way around.

Given that code or rules can be added to a hook even if it doesn't physically exist yet, means that a querying its existence has no real use case (in contrast to other variables that can only be update if they have already been declared). For that reason only the test for emptiness has a public interface.

A hook is said to be empty when no code was added to it, either to its permanent code pool, or to its “next” token list. The hook doesn't need to be declared to have code added to its code pool. A hook is said to exist when it was declared with `\NewHook` or some variant thereof. Generic hooks such as `file` and `env` hooks are automatically declared when code is added to them.

---

<code>\IfHookEmptyTF</code> ★	<code>\IfHookEmptyTF {&lt;hook&gt;} {&lt;true code&gt;} {&lt;false code&gt;}</code>
-------------------------------	---

---

Tests if the `<hook>` is empty (*i.e.*, no code was added to it using either `\AddToHook` or `\AddToHookNext`) or such code was removed again (via `\RemoveFromHook`), and branches to either `<true code>` or `<false code>` depending on the result.

The `<hook>` *cannot* be specified using the dot-syntax. A leading `.` is treated literally.

---

<sup>5</sup>Trying to do so, e.g., via `\DeclareHookRule` with `??` has bad side-effects and is not supported (though not explicitly caught for performance reasons).

### 2.1.9 Displaying hook code

If one has to adjust the code execution in a hook using a hook rule it is helpful to get some information about the code associated with a hook, its current order and the existing rules.

---

<code>\ShowHook</code>	<code>\ShowHook {⟨hook⟩}</code>
<code>\LogHook</code>	<code>\LogHook {⟨hook⟩}</code>

---

Displays information about the `⟨hook⟩` such as

- the code chunks (and their labels) added to it,
- any rules set up to order them,
- the computed order in which the chunks are executed,
- any code executed on the next invocation only.

`\LogHook` prints the information to the `.log` file, and `\ShowHook` prints them to the terminal/command window and starts T<sub>E</sub>X's prompt (only in `\errorstopmode`) to wait for user action.

The `⟨hook⟩` can be specified using the dot-syntax to denote the current package name. See section [2.1.5](#).

Suppose a hook `example-hook` whose output of `\ShowHook{example-hook}` is:

```

1  -> The hook 'example-hook':
2  > Code chunks:
3  >   foo -> [code from package 'foo']
4  >   bar -> [from package 'bar']
5  >   baz -> [package 'baz' is here]
6  > Document-level (top-level) code (executed last):
7  >   -> [code from 'top-level']
8  > Extra code for next invocation:
9  >   -> [one-time code]
10 > Rules:
11 >   foo|baz with relation >
12 >   baz|bar with default relation <
13 > Execution order (after applying rules):
14 >   baz, foo, bar.
```

In the listing above, lines 3 to 5 show the three code chunks added to the hook and their respective labels in the format

`⟨label⟩ -> ⟨code⟩`

Line 7 shows the code chunk added by the user in the main document (labeled `top-level`) in the format

Document-level (top-level) code (executed `⟨first|last⟩`):  
                   `-> ⟨top-level code⟩`

This code will be either the first or last code executed by the hook (**last** if the hook is normal, **first** if it is reversed). This chunk is not affected by rules and does not take part in sorting.

Line 9 shows the code chunk for the next execution of the hook in the format

->  $\langle next-code \rangle$

This code will be used and disappear at the next `\UseHook{example-hook}`, in contrast to the chunks mentioned earlier, which can only be removed from that hook by doing `\RemoveFromHook{<label>}[example-hook]`.

Lines 11 and 12 show the rules declared that affect this hook in the format

$\langle label-1 \rangle | \langle label-2 \rangle$  with  $\langle default? \rangle$  relation  $\langle relation \rangle$

which means that the  $\langle relation \rangle$  applies to  $\langle label-1 \rangle$  and  $\langle label-2 \rangle$ , in that order, as detailed in `\DeclareHookRule`. If the relation is **default** it means that this rule applies to  $\langle label-1 \rangle$  and  $\langle label-2 \rangle$  in *all* hooks, (unless overridden by a non-default relation).

Finally, line 14 lists the labels in the hook after sorting; that is, in the order they will be executed when the hook is used.

### 2.1.10 Debugging hook code

---

<code>\DebugHooksOn</code>	<code>\DebugHooksOn</code>
<code>\DebugHooksOff</code>	

---

Turn the debugging of hook code on or off. This displays most changes made to the hook data structures. The output is rather coarse and not really intended for normal use.

## 2.2 L3 programming layer (expl3) interfaces

This is a quick summary of the L<sup>A</sup>T<sub>E</sub>X3 programming interfaces for use with packages written in **expl3**. In contrast to the L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> interfaces they always use mandatory arguments only, e.g., you always have to specify the  $\langle label \rangle$  for a code chunk. We therefore suggest to use the declarations discussed in the previous section even in **expl3** packages, but the choice is yours.

---

<code>\hook_new:n</code>	<code>\hook_new:n {&lt;hook&gt;}</code>
<code>\hook_new_reversed:n</code>	<code>\hook_new_reversed:n {&lt;hook&gt;}</code>
<code>\hook_new_pair:nn</code>	<code>\hook_new_pair:nn {&lt;hook-1&gt;} {&lt;hook-2&gt;}</code>

---

Creates a new  $\langle hook \rangle$  with normal or reverse ordering of code chunks. `\hook_new_pair:nn` creates a pair of such hooks with  $\{<hook-2>\}$  being a reversed hook. If a hook name is already taken, an error is raised and the hook is not created.

The  $\langle hook \rangle$  can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

---

<code>\hook_disable_generic:n</code>	<code>\hook_disable_generic:n {&lt;hook&gt;}</code>
--------------------------------------	---

---

Marks  $\{<hook>\}$  as disabled. Any further attempt to add code to it or declare it, will result in an error and any call to `\hook_use:n` will simply do nothing.

This declaration is intended for use with generic hooks that are known not to work (see `ltxcmds-hooks-doc`) if they receive code.

The  $\langle hook \rangle$  can be specified using the dot-syntax to denote the current package name. See section 2.1.5.

<hr/> <hr/>	<code>\hook_activate_generic:n</code>	<code>\hook_activate_generic:n {\hook}</code>	<p>This is like <code>\hook_new:n</code> but it does nothing if the hook was previously declared with <code>\hook_new:n</code>. This declaration should be used only in special situations, e.g., when a command from another package needs to be altered and it is not clear whether a generic cmd hook (for that command) has been previously explicitly declared.</p> <p>Normally <code>\hook_new:n</code> should be used instead of this.</p>
<hr/>	<code>\hook_use:n</code>	<code>\hook_use:n {\hook}</code>	<p>Executes the <code>{\hook}</code> code followed (if set up) by the code for next invocation only, then empties that next invocation code.</p> <p>The <code>\hook</code> <i>cannot</i> be specified using the dot-syntax. A leading <code>.</code> is treated literally.</p>
<hr/>	<code>\hook_use_once:n</code>	<code>\hook_use_once:n {\hook}</code>	<p>Changes the <code>{\hook}</code> status so that from now on any addition to the hook code is executed immediately. Then execute any <code>{\hook}</code> code already set up.</p> <p>The <code>\hook</code> <i>cannot</i> be specified using the dot-syntax. A leading <code>.</code> is treated literally.</p>
<hr/>	<code>\hook_gput_code:nnn</code>	<code>\hook_gput_code:nnn {\hook} {\label} {\code}</code>	<p>Adds a chunk of <code>\code</code> to the <code>\hook</code> labeled <code>\label</code>. If the label already exists the <code>\code</code> is appended to the already existing code.</p> <p>If code is added to an external <code>\hook</code> (of the kernel or another package) then the convention is to use the package name as the <code>\label</code> not some internal module name or some other arbitrary string.</p> <p>The <code>\hook</code> and <code>\label</code> can be specified using the dot-syntax to denote the current package name. See section 2.1.5.</p>
<hr/>	<code>\hook_gput_next_code:nn</code>	<code>\hook_gput_next_code:nn {\hook} {\code}</code>	<p>Adds a chunk of <code>\code</code> for use only in the next invocation of the <code>\hook</code>. Once used it is gone.</p> <p>This is simpler than <code>\hook_gput_code:nnn</code>, the code is simply appended to the hook in the order of declaration at the very end, i.e., after all standard code for the hook got executed.</p> <p>Thus if one needs to undo what the standard does one has to do that as part of <code>\code</code>.</p> <p>The <code>\hook</code> can be specified using the dot-syntax to denote the current package name. See section 2.1.5.</p>
<hr/>	<code>\hook_gclear_next_code:n</code>	<code>\hook_gclear_next_code:n {\hook}</code>	<p>Undo any earlier <code>\hook_gput_next_code:nn</code>.</p>



<hr/> <hr/>	<code>\hook_gremove_code:nn</code>	<code>\hook_gremove_code:nn {&lt;hook&gt;} {&lt;label&gt;}</code>
		Removes any code for <i>&lt;hook&gt;</i> labeled <i>&lt;label&gt;</i> . If there is no code under the <i>&lt;label&gt;</i> in the <i>&lt;hook&gt;</i> , or if the <i>&lt;hook&gt;</i> does not exist, a warning is issued when you attempt to use <code>\hook_gremove_code:nn</code> , and the command is ignored. If the second argument is <code>*</code> , then all code chunks are removed. This is rather dangerous as it drops code from other packages one may not know about, so think twice before using that! The <i>&lt;hook&gt;</i> and <i>&lt;label&gt;</i> can be specified using the dot-syntax to denote the current package name. See section 2.1.5.
<hr/> <hr/>	<code>\hook_gset_rule:nnnn</code>	<code>\hook_gset_rule:nnnn {&lt;hook&gt;} {&lt;label1&gt;} {&lt;relation&gt;} {&lt;label2&gt;}</code>
		Relate <i>&lt;label1&gt;</i> with <i>&lt;label2&gt;</i> when used in <i>&lt;hook&gt;</i> . See <code>\DeclareHookRule</code> for the allowed <i>&lt;relation&gt;</i> s. If <i>&lt;hook&gt;</i> is <code>??</code> a default rule is specified. The <i>&lt;hook&gt;</i> and <i>&lt;label&gt;</i> can be specified using the dot-syntax to denote the current package name. See section 2.1.5. The dot-syntax is parsed in both <i>&lt;label&gt;</i> arguments, but it usually makes sense to be used in only one of them.
<hr/> <hr/>	<code>\hook_if_empty_p:n *</code> <code>\hook_if_empty:nTF *</code>	<code>\hook_if_empty:nTF {&lt;hook&gt;} {&lt;true code&gt;} {&lt;false code&gt;}</code>
		Tests if the <i>&lt;hook&gt;</i> is empty ( <i>i.e.</i> , no code was added to it using either <code>\AddToHook</code> or <code>\AddToHookNext</code> ), and branches to either <i>&lt;true code&gt;</i> or <i>&lt;false code&gt;</i> depending on the result. The <i>&lt;hook&gt;</i> <i>cannot</i> be specified using the dot-syntax. A leading <code>.</code> is treated literally.
<hr/> <hr/>	<code>\hook_show:n</code> <code>\hook_log:n</code>	<code>\hook_show:n {&lt;hook&gt;}</code> <code>\hook_log:n {&lt;hook&gt;}</code>
		Displays information about the <i>&lt;hook&gt;</i> such as <ul style="list-style-type: none"> <li>• the code chunks (and their labels) added to it,</li> <li>• any rules set up to order them,</li> <li>• the computed order in which the chunks are executed,</li> <li>• any code executed on the next invocation only.</li> </ul> <code>\hook_log:n</code> prints the information to the <code>.log</code> file, and <code>\hook_show:n</code> prints them to the terminal/command window and starts T <sub>E</sub> X's prompt (only if <code>\errorstopmode</code> ) to wait for user action. The <i>&lt;hook&gt;</i> can be specified using the dot-syntax to denote the current package name. See section 2.1.5.
<hr/> <hr/>	<code>\hook_debug_on:</code> <code>\hook_debug_off:</code>	<code>\hook_debug_on:</code> Turns the debugging of hook code on or off. This displays changes to the hook data.

## 2.3 On the order of hook code execution

Chunks of code for a *<hook>* under different labels are supposed to be independent if there are no special rules set up that define a relation between the chunks. This means that you can't make assumptions about the order of execution!

Suppose you have the following declarations:

```
\NewHook{myhook}
\AddToHook{myhook}[packageA]{\typeout{A}}
\AddToHook{myhook}[packageB]{\typeout{B}}
\AddToHook{myhook}[packageC]{\typeout{C}}
```

then executing the hook with `\UseHook` will produce the typeout A B C in that order. In other words, the execution order is computed to be `packageA`, `packageB`, `packageC` which you can verify with `\ShowHook{myhook}`:

```
-> The hook 'myhook':
> Code chunks:
>   packageA -> \typeout {A}
>   packageB -> \typeout {B}
>   packageC -> \typeout {C}
> Document-level (top-level) code (executed last):
>   ---
> Extra code for next invocation:
>   ---
> Rules:
>   ---
> Execution order:
>   packageA, packageB, packageC.
```

The reason is that the code chunks are internally saved in a property list and the initial order of such a property list is the order in which key-value pairs got added. However, that is only true if nothing other than adding happens!

Suppose, for example, you want to replace the code chunk for `packageA`, e.g.,

```
\RemoveFromHook{myhook}[packageA]
\AddToHook{myhook}[packageA]{\typeout{A alt}}
```

then your order becomes `packageB`, `packageC`, `packageA` because the label got removed from the property list and then re-added (at its end).

While that may not be too surprising, the execution order is also sometimes altered if you add a redundant rule, e.g. if you specify

```
\DeclareHookRule{myhook}{packageA}{before}{packageB}
```

instead of the previous lines we get

```
-> The hook 'myhook':
> Code chunks:
>   packageA -> \typeout {A}
>   packageB -> \typeout {B}
>   packageC -> \typeout {C}
> Document-level (top-level) code (executed last):
>   ---
> Extra code for next invocation:
>   ---
> Rules:
>   packageB|packageA with relation >
> Execution order (after applying rules):
>   packageA, packageC, packageB.
```

As you can see the code chunks are still in the same order, but in the execution order for the labels `packageB` and `packageC` have swapped places. The reason is that, with the rule there are two orders that satisfy it, and the algorithm for sorting happened to pick a different one compared to the case without rules (where it doesn't run at all as there is nothing to resolve). Incidentally, if we had instead specified the redundant rule

```
\DeclareHookRule{myhook}{packageB}{before}{packageC}
```

the execution order would not have changed.

In summary: it is not possible to rely on the order of execution unless there are rules that partially or fully define the order (in which you can rely on them being fulfilled).

## 2.4 The use of “reversed” hooks

You may have wondered why you can declare a “reversed” hook with `\NewReversedHook` and what that does exactly.

In short: the execution order of a reversed hook (without any rules!) is exactly reversed to the order you would have gotten for a hook declared with `\NewHook`.

This is helpful if you have a pair of hooks where you expect to see code added that involves grouping, e.g., starting an environment in the first and closing that environment in the second hook. To give a somewhat contrived example<sup>6</sup>, suppose there is a package adding the following:

```
\AddToHook{env/quote/before}[package-1]{\begin{itshape}}
\AddToHook{env/quote/after} [package-1]{\end{itshape}}
```

As a result, all quotes will be in italics. Now suppose further that another `package-too` makes the quotes also in blue and therefore adds:

```
\usepackage{color}
\AddToHook{env/quote/before}[package-too]{\begin{color}{blue}}
\AddToHook{env/quote/after} [package-too]{\end{color}}
```

Now if the `env/quote/after` hook would be a normal hook we would get the same execution order in both hooks, namely:

```
package-1, package-too
```

(or vice versa) and as a result, would get:

```
\begin{itshape}\begin{color}{blue} ...
\end{itshape}\end{color}
```

and an error message that `\begin{color}` ended by `\end{itshape}`. With `env/quote/after` declared as a reversed hook the execution order is reversed and so all environments are closed in the correct sequence and `\ShowHook` would give us the following output:

```
-> The hook 'env/quote/after':
> Code chunks:
>   package-1 -> \end {itshape}
>   package-too -> \end {color}
> Document-level (top-level) code (executed first):
```

---

<sup>6</sup>there are simpler ways to achieve the same effect.

```

> ---
> Extra code for next invocation:
> ---
> Rules:
> ---
> Execution order (after reversal):
> package-too, package-1.

```

The reversal of the execution order happens before applying any rules, so if you alter the order you will probably have to alter it in both hooks, not just in one, but that depends on the use case.

## 2.5 Difference between “normal” and “one-time” hooks

When executing a hook a developer has the choice of using either `\UseHook` or `\UseOneTimeHook` (or their `expl3` equivalents `\hook_use:n` and `\hook_use_once:n`). This choice affects how `\AddToHook` is handled after the hook has been executed for the first time.

With normal hooks adding code via `\AddToHook` means that the code chunk is added to the hook data structure and then used each time `\UseHook` is called.

With one-time hooks it this is handled slightly differently: After `\UseOneTimeHook` has been called, any further attempts to add code to the hook via `\AddToHook` will simply execute the `<code>` immediately.

This has some consequences one needs to be aware of:

- If `<code>` is added to a normal hook after the hook was executed and it is never executed again for one or the other reason, then this new `<code>` will never be executed.
- In contrast if that happens with a one-time hook the `<code>` is executed immediately.

In particular this means that construct such as

```

\AddToHook{myhook}
{ <code-1> \AddToHook{myhook}{<code-2>} <code-3> }

```

works for one-time hooks<sup>7</sup> (all three code chunks are executed one after another), but it makes little sense with a normal hook, because with a normal hook the first time `\UseHook{myhook}` is executed it would

- execute `<code-1>`,
- then execute `\AddToHook{myhook}{code-2}` which adds the code chunk `<code-2>` to the hook for use on the next invocation,
- and finally execute `<code-3>`.

The second time `\UseHook` is called it would execute the above and in addition `<code-2>` as that was added as a code chunk to the hook in the meantime. So each time the hook is used another copy of `<code-2>` is added and so that code chunk is executed  $\langle \# \text{ of invocations} \rangle - 1$  times.

---

<sup>7</sup>This is sometimes used with `\AtBeginDocument` which is why it is supported.

## 2.6 Generic hooks provided by packages

The hook management system also implements a category of hooks that are called “Generic Hooks”. Normally a hook has to be explicitly declared before it can be used in code. This ensures that different packages are not using the same hook name for unrelated purposes—something that would result in absolute chaos. However, there are a number of “standard” hooks where it is unreasonable to declare them beforehand, e.g., each and every command has (in theory) an associated **before** and **after** hook. In such cases, i.e., for command, environment or file hooks, they can be used simply by adding code to them with `\AddToHook`. For more specialized generic hooks, e.g., those provided by **babel**, you have to additionally enable them with `\ActivateGenericHook` as explained below.

The generic hooks provided by **L<sup>A</sup>T<sub>E</sub>X** are those for `cmd`, `env`, `file`, `include package`, and `class`, and all these are available out of the box: you only have to use `\AddToHook` to add code to them, but you don’t have to add `\UseHook` or `\UseOneTimeHook` to your code, because this is already done for you (or, in the case of `cmd` hooks, the command’s code is patched at `\begin{document}`, if necessary).

However, if you want to provide further generic hooks in your own code, the situation is slightly different. To do this you should use `\UseHook` or `\UseOneTimeHook`, but *without declaring the hook* with `\NewHook`. As mentioned earlier, a call to `\UseHook` with an undeclared hook name does nothing. So as an additional setup step, you need to explicitly activate your generic hook. Note that a generic hook produced in this way is always a normal hook.

For a truly generic hook, with a variable part in the hook name, such upfront activation would be difficult or impossible, because you typically do not know what kind of variable parts may come up in real documents.

For example, **babel** may want to provide hooks such as `babel/⟨language⟩/afterextras`. Language support in **babel** is often done through external language packages. Thus doing the activation for all languages inside the core **babel** code is not a viable approach. Instead it needs to be done by each language package (or by the user who wants to use a particular hook).

Because the hooks are not declared with `\NewHook` their names should be carefully chosen to ensure that they are (likely to be) unique. Best practice is to include the package or command name, as was done in the **babel** example above.

Generic hooks defined in this way are always normal hooks (i.e., you can’t implement reversed hooks this way). This is a deliberate limitation, because it speeds up the processing considerably.

## 2.7 Private **L<sup>A</sup>T<sub>E</sub>X** kernel hooks

There are a few places where it is absolutely essential for **L<sup>A</sup>T<sub>E</sub>X** to function correctly that code is executed in a precisely defined order. Even that could have been implemented with the hook management (by adding various rules to ensure the appropriate ordering with respect to other code added by packages). However, this makes every document unnecessary slow, because there has to be sorting even though the result is predetermined. Furthermore it forces package writers to unnecessarily add such rules if they add further code to the hook (or break **L<sup>A</sup>T<sub>E</sub>X**).

For that reason such code is not using the hook management, but instead private kernel commands directly before or after a public hook with the following naming convention:

`\@kernel@before@<hook>` or `\@kernel@after@<hook>`. For example, in `\enddocument` you find

```
\UseHook{enddocument}%
\@kernel@after@enddocument
```

which means first the user/package-accessible `enddocument` hook is executed and then the internal kernel hook. As their name indicates these kernel commands should not be altered by third-party packages, so please refrain from that in the interest of stability and instead use the public hook next to it.<sup>8</sup>

## 2.8 Legacy L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> interfaces

L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> offered a small number of hooks together with commands to add to them. They are listed here and are retained for backwards compatibility.

With the new hook management, several additional hooks have been added to L<sup>A</sup>T<sub>E</sub>X and more will follow. See the next section for what is already available.

---

<code>\AtBeginDocument</code>	<code>\AtBeginDocument [<i>&lt;label&gt;</i>] {&lt;code&gt;}</code>
-------------------------------	---

---

If used without the optional argument *<label>*, it works essentially like before, i.e., it is adding *<code>* to the hook `begindocument` (which is executed inside `\begin{document}`). However, all code added this way is labeled with the label `top-level` (see section 2.1.6) if done outside of a package or class or with the package/class name if called inside such a file (see section 2.1.5).

This way one can add further code to the hook using `\AddToHook` or `\AtBeginDocument` using a different label and explicitly order the code chunks as necessary, e.g., run some code before or after another package's code. When using the optional argument the call is equivalent to running `\AddToHook {begindocument} [<label>] {<code>}`.

`\AtBeginDocument` is a wrapper around the `begindocument` hook (see section 3.2), which is a one-time hook. As such, after the `begindocument` hook is executed at `\begin{document}` any attempt to add *<code>* to this hook with `\AtBeginDocument` or with `\AddToHook` will cause that *<code>* to execute immediately instead. See section 2.5 for more on one-time hooks.

For important packages with known order requirement we may over time add rules to the kernel (or to those packages) so that they work regardless of the loading-order in the document.

---

<code>\AtEndDocument</code>	<code>\AtEndDocument [<i>&lt;label&gt;</i>] {&lt;code&gt;}</code>
-----------------------------	---

---

Like `\AtBeginDocument` but for the `enddocument` hook.

The few hooks that existed previously in L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> used internally commands such as `\@begindocumenthook` and packages sometimes augmented them directly rather than working through `\AtBeginDocument`. For that reason there is currently support for this, that is, if the system detects that such an internal legacy hook command contains code it adds it to the new hook system under the label `legacy` so that it doesn't get lost.

However, over time the remaining cases of direct usage need updating because in one of the future release of L<sup>A</sup>T<sub>E</sub>X we will turn this legacy support off, as it does unnecessary slow down the processing.

---

<sup>8</sup>As with everything in T<sub>E</sub>X there is not enforcement of this rule, and by looking at the code it is easy to find out how the kernel adds to them. The main reason of this section is therefore to say “please don't do that, this is unconfigurable code!”

## 3 L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> commands and environments augmented by hooks

In this section we describe the standard hooks that are now offered by L<sup>A</sup>T<sub>E</sub>X, or give pointers to other documents in which they are described. This section will grow over time (and perhaps eventually move to `usrguide3`).

### 3.1 Generic hooks

As stated earlier, with the exception of generic hooks, all hooks must be declared with `\NewHook` before they can be used. All generic hooks have names of the form “`<type>/<name>/<position>`”, where `<type>` is from the predefined list shown below, and `<name>` is the variable part whose meaning will depend on the `<type>`. The last component, `<position>`, has more complex possibilities: it can always be `before` or `after`; for `env` hooks, it can also be `begin` or `end`; and for `include` hooks it can also be `end`. Each specific hook is documented below, or in `lthooks-doc.pdf` or `lthooks-doc.pdf`.

The generic hooks provided by L<sup>A</sup>T<sub>E</sub>X belong to one of the six types:

- env** Hooks executed before and after environments – `<name>` is the name of the environment, and available values for `<position>` are `before`, `begin`, `end`, and `after`;
- cmd** Hooks added to and executed before and after commands – `<name>` is the name of the command, and available values for `<position>` are `before` and `after`;
- file** Hooks executed before and after reading a file – `<name>` is the name of the file (with extension), and available values for `<position>` are `before` and `after`;
- package** Hooks executed before and after loading packages – `<name>` is the name of the package, and available values for `<position>` are `before` and `after`;
- class** Hooks executed before and after loading classes – `<name>` is the name of the class, and available values for `<position>` are `before` and `after`;
- include** Hooks executed before and after `\included` files – `<name>` is the name of the included file (without the `.tex` extension), and available values for `<position>` are `before`, `end`, and `after`.

Each of the hooks above are detailed in the following sections and in linked documentation.

#### 3.1.1 Generic hooks for all environments

Every environment `<env>` has now four associated hooks coming with it:

- env/<env>/before** This hook is executed as part of `\begin` as the very first action, in particular prior to starting the environment group. Its scope is therefore not restricted by the environment.
- env/<env>/begin** This hook is executed as part of `\begin` directly in front of the code specific to the environment start (e.g., the second argument of `\newenvironment`). Its scope is the environment body.
- env/<env>/end** This hook is executed as part of `\end` directly in front of the code specific to the end of the environment (e.g., the third argument of `\newenvironment`).

**env/⟨env⟩/after** This hook is executed as part of `\end` after the code specific to the environment end and after the environment group has ended. Its scope is therefore not restricted by the environment.

The hook is implemented as a reversed hook so if two packages add code to `env/⟨env⟩/before` and to `env/⟨env⟩/after` they can add surrounding environments and the order of closing them happens in the right sequence.

Generic environment hooks are never one-time hooks even with environments that are supposed to appear only once in a document.<sup>9</sup> In contrast to other hooks there is also no need to declare them using `\NewHook`.

The hooks are only executed if `\begin{⟨env⟩}` and `\end{⟨env⟩}` is used. If the environment code is executed via low-level calls to `\⟨env⟩` and `\end⟨env⟩` (e.g., to avoid the environment grouping) they are not available. If you want them available in code using this method, you would need to add them yourself, i.e., write something like

```
\UseHook{env/quote/before}\quote
...
\endquote\UseHook{env/quote/after}
```

to add the outer hooks, etc.

Largely for compatibility with existing packages, the following four commands are also available to set the environment hooks; but for new packages we recommend directly using the hook names and `\AddToHook`.

<hr/> <hr/>	<code>\BeforeBeginEnvironment [⟨label⟩] {⟨env⟩} {⟨code⟩}</code>	
		This declaration adds to the <code>env/⟨env⟩/before</code> hook using the <code>⟨label⟩</code> . If <code>⟨label⟩</code> is not given, the <code>⟨default label⟩</code> is used (see section 2.1.5).
<hr/> <hr/>	<code>\AtBeginEnvironment [⟨label⟩] {⟨env⟩} {⟨code⟩}</code>	
		This is like <code>\BeforeBeginEnvironment</code> but it adds to the <code>env/⟨env⟩/begin</code> hook.
<hr/> <hr/>	<code>\AtEndEnvironment [⟨label⟩] {⟨env⟩} {⟨code⟩}</code>	
		This is like <code>\BeforeBeginEnvironment</code> but it adds to the <code>env/⟨env⟩/end</code> hook.
<hr/> <hr/>	<code>\AfterEndEnvironment [⟨label⟩] {⟨env⟩} {⟨code⟩}</code>	
		This is like <code>\BeforeBeginEnvironment</code> but it adds to the <code>env/⟨env⟩/after</code> hook.

### 3.1.2 Generic hooks for commands

Similar to environments there are now (at least in theory) two generic hooks available for any L<sup>A</sup>T<sub>E</sub>X command. These are

**cmd/⟨name⟩/before** This hook is executed at the very start of the command execution.

**cmd/⟨name⟩/after** This hook is executed at the very end of the command body. It is implemented as a reversed hook.

In practice there are restrictions and especially the **after** hook works only with a subset of commands. Details about these restrictions are documented in `ltxcmdhooks-doc.pdf` or with code in `ltxcmdhooks-code.pdf`.

<sup>9</sup>Thus if one adds code to such hooks after the environment has been processed, it will only be executed if the environment appears again and if that doesn't happen the code will never get executed.



### 3.1.3 Generic hooks provided by file loading operations

There are several hooks added to L<sup>A</sup>T<sub>E</sub>X's process of loading file via its high-level interfaces such as `\input`, `\include`, `\usepackage`, `\RequirePackage`, etc. These are documented in `lthook-doc.pdf` or with code in `lthook-code.pdf`.

## 3.2 Hooks provided by `\begin{document}`

Until 2020 `\begin{document}` offered exactly one hook that one could add to using `\AtBeginDocument`. Experiences over the years have shown that this single hook in one place was not enough and as part of adding the general hook management system a number of additional hooks have been added at this point. The places for these hooks have been chosen to provide the same support as offered by external packages, such as `etoolbox` and others that augmented `\document` to gain better control.

Supported are now the following hooks (all of them one-time hooks):

**`begindocument/before`** This hook is executed at the very start of `\document`, one can think of it as a hook for code at the end of the preamble section and this is how it is used by `etoolbox`'s `\AtEndPreamble`.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

**`begindocument`** This hook is added to when using `\AtBeginDocument` and it is executed after the `.aux` file as be read in and most initialization are done, so they can be altered and inspected by the hook code. It is followed by a small number of further initializations that shouldn't be altered and are therefore coming later.

The hook should not be used to add material for typesetting as we are still in L<sup>A</sup>T<sub>E</sub>X's initialization phase and not in the document body. If such material needs to be added to the document body use the next hook instead.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

**`begindocument/end`** This hook is executed at the end of the `\document` code in other words at the beginning of the document body. The only command that follows it is `\ignorespaces`.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

The generic hooks executed by `\begin` also exist, i.e., `env/document/before` and `env/document/begin`, but with this special environment it is better use the dedicated one-time hooks above.

## 3.3 Hooks provided by `\end{document}`

L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> always provided `\AtEndDocument` to add code to the execution of `\end{document}` just in front of the code that is normally executed there. While this was a big improvement over the situation in L<sup>A</sup>T<sub>E</sub>X 2.09 it was not flexible enough for a number of use cases and so packages, such as `etoolbox`, `atveryend` and others patched `\enddocument` to add additional points where code could be hooked into.

Patching using packages is always problematical as leads to conflicts (code availability, ordering of patches, incompatible patches, etc.). For this reason a number of

additional hooks have been added to the `\enddocument` code to allow packages to add code in various places in a controlled way without the need for overwriting or patching the core code.

Supported are now the following hooks (all of them one-time hooks):

**enddocument** The hook associated with `\AtEndDocument`. It is immediately called at the beginning of `\enddocument`.

When this hook is executed there may be still unprocessed material (e.g., floats on the deferlist) and the hook may add further material to be typeset. After it, `\clearpage` is called to ensure that all such material gets typeset. If there is nothing waiting the `\clearpage` has no effect.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

**enddocument/afterlastpage** As the name indicates this hook should not receive code that generates material for further pages. It is the right place to do some final housekeeping and possibly write out some information to the `.aux` file (which is still open at this point to receive data, but since there will be no more pages you need to write to it using `\immediate\write`). It is also the correct place to set up any testing code to be run when the `.aux` file is re-read in the next step.

After this hook has been executed the `.aux` file is closed for writing and then read back in to do some tests (e.g., looking for missing references or duplicated labels, etc.).

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

**enddocument/afteraux** At this point, the `.aux` file has been reprocessed and so this is a possible place for final checks and display of information to the user. However, for the latter you might prefer the next hook, so that your information is displayed after the (possibly longish) list of files if that got requested via `\listfiles`.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

**enddocument/info** This hook is meant to receive code that write final information messages to the terminal. It follows immediately after the previous hook (so both could have been combined, but then packages adding further code would always need to also supply an explicit rule to specify where it should go.

This hook already contains some code added by the kernel (under the labels `kernel/filelist` and `kernel/warnings`), namely the list of files when `\listfiles` has been used and the warnings for duplicate labels, missing references, font substitutions etc.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).

**enddocument/end** Finally, this hook is executed just in front of the final call to `\@@end`.

This is a one-time hook, so after it is executed, all further attempts to add code to it will execute such code immediately (see section 2.5).is it even possible to add code after this one?

There is also the hook `shipout/lastpage`. This hook is executed as part of the last `\shipout` in the document to allow package to add final `\special`'s to that page. Where this hook is executed in relation to those from the above list can vary from document to document. Furthermore to determine correctly which of the `\shipouts` is the last one,  $\text{\LaTeX}$  needs to be run several times, so initially it might get executed on the wrong page. See section 3.4 for where to find the details.

It is also possible to use the generic `env/document/end` hook which is executed by `\end`, i.e., just in front of the first hook above. Note however that the other generic `\end` environment hook, i.e., `env/document/after` will never get executed, because by that time  $\text{\LaTeX}$  has finished the document processing.

### 3.4 Hooks provided by `\shipout` operations

There are several hooks and mechanisms added to  $\text{\LaTeX}$ 's process of generating pages. These are documented in `ltshipout-doc.pdf` or with code in `ltshipout-code.pdf`.

### 3.5 Hooks provided for paragraphs

The paragraph processing has been augmented to include a number of internal and public hooks. These are documented in `ltpara-doc.pdf` or with code in `ltpara-code.pdf`.

### 3.6 Hooks provided in NFSS commands

In languages that need to support for more than one script in parallel (and thus several sets of fonts, e.g., supporting both Latin and Japanese fonts), NFSS font commands such as `\sffamily` need to switch both the Latin family to “Sans Serif” and in addition alter a second set of fonts.

To support this, several NFSS commands have hooks to which such support can be added.

**rmfamily** After `\rmfamily` has done its initial checks and prepared a font series update, this hook is executed before `\selectfont`.

**sffamily** This is like the `rmfamily` hook, but for the `\sffamily` command.

**ttfamily** This is like the `rmfamily` hook, but for the `\ttfamily` command.

**normalfont** The `\normalfont` command resets the font encoding, family, series and shape to their document defaults. It then executes this hook and finally calls `\selectfont`.

**expand@font@defaults** The internal `\expand@font@defaults` command expands and saves the current defaults for the meta families (rm/sf/tt) and the meta series (bf/md). If the NFSS machinery has been augmented, e.g., for Chinese or Japanese fonts, then further defaults may need to be set at this point. This can be done in this hook which is executed at the end of this macro.

**bfseries/defaults, bfseries** If the `\bfdefault` was explicitly changed by the user, its new value is used to set the bf series defaults for the meta families (rm/sf/tt) when `\bfseries` is called. The `bfseries/defaults` hook allows further adjustments to be made in this case. This hook is only executed if such a change is detected. In contrast, the `bfseries` hook is always executed just before `\selectfont` is called to change to the new series.

**mdseries/defaults, mdseries** These two hooks are like the previous ones but they are in the `\mdseries` command.

**selectfont** This hook is executed inside `\selectfont`, after the current values for *encoding*, *family*, *series*, *shape*, and *size* are evaluated and the new font is selected (and if necessary loaded). After the hook has executed, NFSS will still do any updates necessary for a new *size* (such as changing the size of `\strut`) and any updates necessary to a change in *encoding*.

This hook is intended for use cases where, in parallel to a change in the main font, some other fonts need to be altered (e.g., in CJK processing where you may need to deal with several different alphabets).

### 3.7 Hook provided by the mark mechanism

See `ltmarks-doc.pdf` for details.

**insertmark** This hook allows for a special setup while `\InsertMark` inserts a mark. It is executed in group so local changes only apply to the mark being inserted.

## 4 The Implementation

```

1 <@@=hook>
2 <*2ekernel | latexrelease>
3 \ExplSyntaxOn
4 <latexrelease> \NewModuleRelease{2020/10/01}{lthooks}
5 <latexrelease> {The~hook~management~system}
```

### 4.1 Debugging

```

\g__hook_debug_bool Holds the current debugging state.
6 \bool_new:N \g__hook_debug_bool

(End definition for \g__hook_debug_bool.)

\hook_debug_on: Turns debugging on and off by redefining \__hook_debug:n.
\hook_debug_off:
  \__hook_debug:n
\__hook_debug_gset:
9 {
10   \bool_gset_true:N \g__hook_debug_bool
11   \__hook_debug_gset:
12 }
13 \cs_new_protected:Npn \hook_debug_off:
14 {
15   \bool_gset_false:N \g__hook_debug_bool
16   \__hook_debug_gset:
17 }
18 \cs_new_protected:Npn \__hook_debug_gset:
19 {
20   \cs_gset_protected:Npx \__hook_debug:n ##1
21   { \bool_if:NT \g__hook_debug_bool {##1} }
22 }
```

(End definition for `\hook_debug_on:` and others. These functions are documented on page 193.)

## 4.2 Borrowing from internals of other kernel modules

`\__hook_str_compare:nn` Private copy of `\__str_if_eq:nn`  
`23 \cs_new_eq:NN \__hook_str_compare:nn \__str_if_eq:nn`  
*(End definition for \\_\_hook\_str\_compare:nn.)*

## 4.3 Declarations

`\l__hook_tmpa_bool` Scratch boolean used throughout the package.  
`24 \bool_new:N \l__hook_tmpa_bool`  
*(End definition for \l\_\_hook\_tmpa\_bool.)*

`\l__hook_return_tl` Scratch variables used throughout the package.  
`\l__hook_tmpa_tl` `25 \tl_new:N \l__hook_return_tl`  
`\l__hook_tmpb_tl` `26 \tl_new:N \l__hook_tmpa_tl`  
`27 \tl_new:N \l__hook_tmpb_tl`  
*(End definition for \l\_\_hook\_return\_tl, \l\_\_hook\_tmpa\_tl, and \l\_\_hook\_tmpb\_tl.)*

`\g__hook_all_seq` In a few places we need a list of all hook names ever defined so we keep track if them in this sequence.  
`28 \seq_new:N \g__hook_all_seq`  
*(End definition for \g\_\_hook\_all\_seq.)*

`\l__hook_cur_hook_tl` Stores the name of the hook currently being sorted.  
`29 \tl_new:N \l__hook_cur_hook_tl`  
*(End definition for \l\_\_hook\_cur\_hook\_tl.)*

`\l__hook_work_prop` A property list holding a copy of the `\g__hook_{hook}_code_prop` of the hook being sorted to work on, so that changes don't act destructively on the hook data structure.  
`30 \prop_new:N \l__hook_work_prop`  
*(End definition for \l\_\_hook\_work\_prop.)*

`\g__hook_used_prop` All hooks that receive code (for use in debugging display).  
`31 \prop_new:N \g__hook_used_prop`  
*(End definition for \g\_\_hook\_used\_prop.)*

`\g__hook_hook_curr_name_tl` Default label used for hook commands, and a stack to keep track of packages within packages.  
`\g__hook_name_stack_seq` `32 \tl_new:N \g__hook_hook_curr_name_tl`  
`33 \seq_new:N \g__hook_name_stack_seq`  
*(End definition for \g\_\_hook\_hook\_curr\_name\_tl and \g\_\_hook\_name\_stack\_seq.)*

`\__hook_tmp:w` Temporary macro for generic usage.  
`34 \cs_new_eq:NN \__hook_tmp:w ?`  
*(End definition for \\_\_hook\_tmp:w.)*

`\tl_gremove_once:Nx` Some variants of `expl3` functions.  
`\tl_show:x`  
`\tl_log:x`

File h: lthooks.dtx

*FMi: should probably be moved to expl3*

```
35 \cs_generate_variant:Nn \tl_gremove_once:Nn { Nx }
36 \cs_generate_variant:Nn \tl_show:n { x }
37 \cs_generate_variant:Nn \tl_log:n { x }
```

*(End definition for \tl\_gremove\_once:Nx, \tl\_show:x, and \tl\_log:x.)*

\s\_\_hook\_mark Scan mark used for delimited arguments.

```
38 \scan_new:N \s__hook_mark
```

*(End definition for \s\_\_hook\_mark.)*

\\_\_hook\_clean\_to\_scan:w Removes tokens until the next \s\_\_hook\_mark.

```
39 \cs_new:Npn \__hook_clean_to_scan:w #1 \s__hook_mark { }
```

*(End definition for \\_\_hook\_clean\_to\_scan:w.)*

\\_\_hook\_tl\_set:Nn Private copies of a few expl3 functions. l3debug will only add debugging to the public names, not to these copies, so we don't have to use \debug\_suspend: and \debug\_resume: everywhere.

\\_\_hook\_tl\_set:Nx Functions like \\_\_hook\_tl\_set:Nn have to be redefined, rather than copied because in expl3 they use \\_\_kernel\_tl\_(g)set:Nx, which is also patched by l3debug.

```
40 \cs_new_protected:Npn \__hook_tl_set:Nn #1#2
41   { \cs_set_nopar:Npx #1 { \__kernel_exp_not:w {#2} } }
42 \cs_new_protected:Npn \__hook_tl_set:Nx #1#2
43   { \cs_set_nopar:Npx #1 {#2} }
44 \cs_generate_variant:Nn \__hook_tl_set:Nn { c }
45 \cs_generate_variant:Nn \__hook_tl_set:Nx { c }
```

*(End definition for \\_\_hook\_tl\_set:Nn.)*

\\_\_hook\_tl\_gset:Nn Same as above.

```
46 \cs_new_protected:Npn \__hook_tl_gset:Nn #1#2
47   { \cs_gset_nopar:Npx #1 { \__kernel_exp_not:w {#2} } }
48 \cs_new_protected:Npn \__hook_tl_gset:No #1#2
49   { \cs_gset_nopar:Npx #1 { \__kernel_exp_not:w \exp_after:wN {#2} } }
50 \cs_new_protected:Npn \__hook_tl_gset:Nx #1#2
51   { \cs_gset_nopar:Npx #1 {#2} }
52 \cs_generate_variant:Nn \__hook_tl_gset:Nn { c }
53 \cs_generate_variant:Nn \__hook_tl_gset:No { c }
54 \cs_generate_variant:Nn \__hook_tl_gset:Nx { c }
```

*(End definition for \\_\_hook\_tl\_gset:Nn.)*

\\_\_hook\_tl\_gput\_right:Nn Same as above.

```
55 \cs_new_protected:Npn \__hook_tl_gput_right:Nn #1#2
56   { \__hook_tl_gset:Nx #1 { \__kernel_exp_not:w \exp_after:wN { #1 #2 } } }
57 \cs_generate_variant:Nn \__hook_tl_gput_right:Nn { No, cn }
```

*(End definition for \\_\_hook\_tl\_gput\_right:Nn.)*

`\_hook_tl_gput_left:Nn` Same as above.

`\_hook_tl_gput_left:No`

```

58 \cs_new_protected:Npn \_hook_tl_gput_left:Nn #1#2
59 {
60   \_hook_tl_gset:Nx #1
61   { \_kernel_exp_not:w {#2} \_kernel_exp_not:w \exp_after:wN {#1} }
62 }
63 \cs_generate_variant:Nn \_hook_tl_gput_left:Nn { No }

```

(End definition for `\_hook_tl_gput_left:Nn`.)

`\_hook_tl_gset_eq:NN` Same as above.

```

64 \cs_new_eq:NN \_hook_tl_gset_eq:NN \tl_gset_eq:NN

```

(End definition for `\_hook_tl_gset_eq:NN`.)

`\_hook_tl_gclear:N` Same as above.

`\_hook_tl_gclear:c`

```

65 \cs_new_protected:Npn \_hook_tl_gclear:N #1
66 { \_hook_tl_gset_eq:NN #1 \c_empty_tl }
67 \cs_generate_variant:Nn \_hook_tl_gclear:N { c }

```

(End definition for `\_hook_tl_gclear:N`.)

## 4.4 Providing new hooks

### 4.4.1 The data structures of a hook

`\g_@@_<hook>_code_prop` Hooks have a name (called `<hook>` in the description below) and for each hook we have to provide a number of data structures. These are

`\@@_next_<hook>` `\g_<hook>_code_prop` A property list holding the code for the hook in separate chunks. The keys are by default the package names that add code to the hook, but it is possible for packages to define other keys.

`\g_<hook>_rule_<label1>|<label2>_tl` A token list holding the relation between `<label1>` and `<label2>` in the `<hook>`. The `<labels>` are lexically (reverse) sorted to ensure that two labels always point to the same token list. For global rules, the `<hook>` name is `??`.

`\_hook_<hook>` The code that is actually executed when the hook is called in the document is stored in this token list. It is constructed from the code chunks applying the information. This token list is named like that so that in case of an error inside the hook, the reported token list in the error is shorter, and to make it simpler to normalize hook names in `\_hook_make_name:n`.

`\g_<hook>_reversed_tl` Some hooks are “reversed”. This token list stores a `-` for such hook so that it can be identified. The `-` character is used because `<reversed>1` is `+1` for normal hooks and `-1` for reversed ones.

`\g_<hook>_declared_tl` This token list serves as marker for the hook being officially declared. Its existence is tested to raise an error in case another declaration is attempted.

`\__hook_toplevel_⟨hook⟩` This token list stores the code inserted in the hook from the user’s document, in the `top-level` label. This label is special, and doesn’t participate in sorting. Instead, all code is appended to it and executed after (or before, if the hook is reversed) the normal hook code, but before the `next` code chunk.

`\__hook_next_⟨hook⟩` Finally there is extra code (normally empty) that is used on the next invocation of the hook (and then deleted). This can be used to define some special behavior for a single occasion from within the document. This token list follows the same naming scheme than the main `\__hook_⟨hook⟩` token list. It is called `\__hook_next_⟨hook⟩` rather than `\__hook_next_⟨hook⟩` because otherwise a hook whose name is `next_⟨hook⟩` would clash with the next code-token list of the hook called `⟨hook⟩`.

#### 4.4.2 On the existence of hooks

A hook may be in different states of existence. Here we give an overview of the internal commands to set up hooks and explain how the different states are distinguished. The actual implementation then follows in subsequent sections.

One problem we have to solve is that we need to be able to add code to hooks (e.g., with `\AddToHook`) even if that code has not yet been declared. For example, one package needs to write into a hook of another package, but that package may not get loaded, or is loaded only later. Another problem is that most hooks, but not the generic hooks, require a declaration.

We therefore distinguish the following states for a hook, which are managed by four different tests: structure existence (`\__hook_if_structure_exist:nTF`), creation (`\__hook_if_usable:nTF`), declaration (`\__hook_if_declared:nTF`) and disabled or not (`\__hook_if_disabled:nTF`)

**not existing** Nothing is known about the hook so far. This state can be detected with `\__hook_if_structure_exist:nTF` (which uses the false branch).

In this state the hook can be declared, disabled, rules can be defined or code could be added to it, but it is not possible to use the hook (with `\UseHook`).

**basic data structure set up** A hook is in this state when its basic data structure has been set up (using `\__hook_init_structure:n`). The data structure setup happens automatically when commands such as `\AddToHook` are used and the hook is at that point in state “not existing”.

In this state the four tests give the following results:

```
\__hook_if_structure_exist:nTF returns true.
      \__hook_if_usable:nTF returns false.
      \__hook_if_declared:nTF returns false.
      \__hook_if_disabled:nTF returns false.
```

The allowed actions are the same as in the “not existing” state.

**declared** A hook is in this state if it is not disabled and was explicitly declared (e.g., with `\NewHook`). In this case the four tests give the following results:

```
\__hook_if_structure_exist:nTF returns true.
```



```

    \__hook_if_usable:nTF returns true.
    \__hook_if_declared:nTF returns true.
    \__hook_if_disabled:nTF returns false.

```

**usable** A hook is in this state if it is not disabled, was not explicitly declared but nevertheless is allowed to be used (with `\UseHook` or `\hook_use:n`). This state is only possible for generic hooks as they do not need to be declared. Therefore such hooks move directly from state “not existing” to “usable” the moment a declaration such as `\AddToHook` wants to add to the hook data structure. In this state the tests give the following results:

```

\__hook_if_structure_exist:nTF returns true.
    \__hook_if_usable:nTF returns true.
    \__hook_if_declared:nTF returns false.
    \__hook_if_disabled:nTF returns false.

```

**disabled** A generic hook in any state is moved to this state when `\DisableGenericHook` is used. This changes the tests to give the following results:

```

\__hook_if_structure_exist:nTF unchanged.
    \__hook_if_usable:nTF returns false.
    \__hook_if_declared:nTF returns true.
    \__hook_if_disabled:nTF returns true.

```

The structure test is unchanged (if the hook was unknown before it is **false**, otherwise **true**). The usable test returns **false** so that any `\UseHook` will bypass the hook from now on. The declared test returns **true** so that any further `\NewHook` generates an error and the disabled test returns **true** so that `\AddToHook` can return an error.

*FMi: maybe it should do this only after begin document?*

#### 4.4.3 Setting hooks up

`\hook_new:n` The `\hook_new:n` declaration declares a new hook and expects the hook  $\langle name \rangle$  as its argument, e.g., `begindocument`.

```

68 \cs_new_protected:Npn \hook_new:n #1
69   { \__hook_normalize_hook_args:Nn \__hook_new:n {#1} }
70 \cs_new_protected:Npn \__hook_new:n #1
71   {

```

We check if the hook was already *explicitly* declared with `\hook_new:n`, and if it already exists we complain, otherwise set the “created” flag for the hook so that it errors next time `\hook_new:n` is used.

```

72     \__hook_if_declared:nTF {#1}
73     { \msg_error:nnn { hooks } { exists } {#1} }
74     {
75         \tl_new:c { g__hook_#1_declared_tl }
76         \__hook_make_usable:n {#1}
77     }
78 }

```

(End definition for `\hook_new:n` and `\__hook_new:n`. This function is documented on page 191.)

`\__hook_make_usable:n` This initializes all hook data structures for the hook but if used on its own doesn't mark the hook as declared (as `\hook_new:n` does, so a later `\hook_new:n` on that hook will not result in an error. This command is internally used by `\hook_gput_code:n` when adding code to a generic hook.

```
79 \cs_new_protected:Npn \__hook_make_usable:n #1
80 {
```

Now we check if the hook's data structure can be safely created without `expl3` raising errors, then we add the hook name to the list of all hooks and allocate the necessary data structures for the new hook, otherwise just do nothing.

```
81 \tl_if_exist:cF { __hook~#1 }
82 {
83 \seq_gput_right:Nn \g__hook_all_seq {#1}
```

This is only used by the actual code of the current hook, so declare it normally:

```
84 \tl_new:c { __hook~#1 }
```

Now ensure that the base data structure for the hook exists:

```
85 \__hook_init_structure:n {#1}
```

The `\g__hook_⟨hook⟩_labels_clist` holds the sorted list of labels (once it got sorted). This is used only for debugging.

```
86 \clist_new:c { g__hook_#1_labels_clist }
```

Some hooks should reverse the default order of code chunks. To signal this we have a token list which is empty for normal hooks and contains a `-` for reversed hooks.

```
87 \tl_new:c { g__hook_#1_reversed_tl }
```

The above is all in L3 convention, but we also provide an interface to legacy  $\text{\LaTeX 2}_{\epsilon}$  hooks of the form `\@...hook`, e.g., `\@begindocumenthook`. There have been a few of them and they have been added to using `\g@addto@macro`. If there exists such a macro matching the name of the new hook, i.e., `\@⟨hook-name⟩hook` and it is not empty then we add its contents as a code chunk under the label `legacy`.

**Warning: this support will vanish in future releases!**

```
88 \__hook_include_legacy_code_chunk:n {#1}
89 }
90 }
```

(End definition for `\__hook_make_usable:n`.)

`\__hook_init_structure:n` This function declares the basic data structures for a hook without explicitly declaring the hook itself. This is needed to allow adding to undeclared hooks. Here it is unnecessary to check whether all variables exist, since all three are declared at the same time (either all of them exist, or none).

It creates the hook code pool (`\g__hook_⟨hook⟩_code_prop`) and the `top-level` and `next` token lists. A hook is initialized with `\__hook_init_structure:n` the first time anything is added to it. Initializing a hook just with `\__hook_init_structure:n` will not make it usable with `\hook_use:n`.

```
91 \cs_new_protected:Npn \__hook_init_structure:n #1
92 {
93 \__hook_if_structure_exist:nF {#1}
94 {
```

```

95     \prop_new:c { g__hook_#1_code_prop }
96     \tl_new:c { __hook_toplevel~#1 }
97     \tl_new:c { __hook_next~#1 }
98   }
99 }

```

(End definition for `\__hook_init_structure:n`.)

**`\hook_new_reversed:n`** Declare a new hook. The default ordering of code chunks is reversed, signaled by setting the token list to a minus sign.

`\__hook_new_reversed:n`

```

100 \cs_new_protected:Npn \hook_new_reversed:n #1
101   { \__hook_normalize_hook_args:Nn \__hook_new_reversed:n {#1} }
102 \cs_new_protected:Npn \__hook_new_reversed:n #1
103   {
104     \__hook_new:n {#1}

```

If the hook already exists the above will generate an error message, so the next line should be executed (but it is — too bad).

```

105     \tl_gset:cn { g__hook_#1_reversed_tl } { - }
106   }

```

(End definition for `\hook_new_reversed:n` and `\__hook_new_reversed:n`. This function is documented on page 191.)

**`\hook_new_pair:nn`** A shorthand for declaring a normal and a (matching) reversed hook in one go.

```

107 \cs_new_protected:Npn \hook_new_pair:nn #1#2
108   { \hook_new:n {#1} \hook_new_reversed:n {#2} }

```

(End definition for `\hook_new_pair:nn`. This function is documented on page 191.)

`\__hook_include_legacy_code_chunk:n`

The L<sup>A</sup>T<sub>E</sub>X legacy concept for hooks uses with hooks the following naming scheme in the code: `\@...hook`.

If this macro is not empty we add it under the label `legacy` to the current hook and then empty it globally. This way packages or classes directly manipulating commands such as `\@begindocumenthook` still get their hook data added.

**Warning: this support will vanish in future releases!**

```

109 \cs_new_protected:Npn \__hook_include_legacy_code_chunk:n #1
110   {

```

If the macro doesn't exist (which is the usual case) then nothing needs to be done.

```

111     \tl_if_exist:cT { @#1hook }

```

Of course if the legacy hook exists but is empty, there is no need to add anything under `legacy` the legacy label.

```

112     {
113       \tl_if_empty:cF { @#1hook }
114       {
115         \exp_args:Nnnv \__hook_hook_gput_code_do:nnn {#1}
116           { legacy } { @#1hook }

```

Once added to the hook, we need to clear it otherwise it might get added again later if the hook data gets updated.

```

117         \__hook_tl_gclear:c { @#1hook }
118       }
119     }
120   }

```

(End definition for `\__hook_include_legacy_code_chunk:n`.)

#### 4.4.4 Disabling and providing hooks

`\hook_disable_generic:n` Disables a hook by creating its `\g__hook_⟨hook⟩_declared_tl` so that the hook errors when used with `\hook_new:n`, then it undefines `\__hook_⟨hook⟩` so that it may not be executed.

`\__hook_if_disabled_p:n` This does not clear any code that may be already stored in the hook's structure, but doesn't allow adding more code. `\__hook_if_disabled:nTF` uses that specific combination to check if the hook is disabled.

```

121 <latexrelease>\IncludeInRelease{2021/06/01}%
122 <latexrelease>          {\hook_disable_generic:n}{Disable-hooks}

123 \cs_new_protected:Npn \hook_disable_generic:n #1
124   { \__hook_normalize_hook_args:Nn \__hook_disable:n {#1} }
125 \cs_new_protected:Npn \__hook_disable:n #1
126   {
127     \tl_gclear_new:c { g__hook_#1_declared_tl }
128     \cs_undefine:c { __hook~#1 }
129   }
130 \prg_new_conditional:Npnn \__hook_if_disabled:n #1 { p, T, F, TF }
131   {
132     \bool_lazy_and:nnTF
133       { \tl_if_exist_p:c { g__hook_#1_declared_tl } }
134       { ! \tl_if_exist_p:c { __hook~#1 } }
135       { \prg_return_true: }
136       { \prg_return_false: }
137   }
138 <latexrelease>\EndIncludeInRelease

139 <latexrelease>\IncludeInRelease{2020/10/01}
140 <latexrelease>          {\hook_disable_generic:n}{Disable-hooks}
141 <latexrelease>
142 <latexrelease>\cs_new_protected:Npn \hook_disable_generic:n #1 {}
143 <latexrelease>
144 <latexrelease>\EndIncludeInRelease

```

(End definition for `\hook_disable_generic:n`, `\__hook_disable:n`, and `\__hook_if_disabled:nTF`.  
This function is documented on page 191.)

`\hook_activate_generic:n` The `\hook_activate_generic:n` declaration declares a new hook if it wasn't declared already, in which case it only checks that the already existing hook is not a reversed hook.

```

145 <latexrelease>\IncludeInRelease{2021/06/01}%
146 <latexrelease>          {\hook_activate_generic:n}{Providing-hooks}

147 \cs_new_protected:Npn \hook_activate_generic:n #1
148   { \__hook_normalize_hook_args:Nn \__hook_activate_generic:nn {#1} { } }
149 \cs_new_protected:Npn \__hook_activate_generic:nn #1 #2
150   {

```

If the hook to be activated was disabled we warn (for now — this may change).

```

151     \__hook_if_disabled:nTF {#1}
152     { \msg_warning:nnn { hooks } { activate-disabled } {#1} }

```

Otherwise we check if the hook is not declared, and if it isn't, figure out if it's reversed or not, then declare it accordingly.

```

153     {
154       \__hook_if_declared:nF {#1}

```

```

155     {
156       \tl_new:c { g__hook_#1_declared_tl }
157       \__hook_make_usable:n {#1}
158       \tl_gset:cx { g__hook_#1_reversed_tl }
159       { \__hook_if_generic_reversed:nT {#1} { - } }

```

Reflect that we have activated the generic hook and set its execution code.

```

160       \__hook_update_hook_code:n {#1}
161     }
162   }
163 }

```

(End definition for `\hook_activate_generic:n` and `\__hook_activate_generic:n`. This function is documented on page 192.)

```

164 <latexrelease>\EndIncludeInRelease
165 <latexrelease>\IncludeInRelease{2020/10/01}
166 <latexrelease>          {\hook_activate_generic:n}{Providing-hooks}
167 <latexrelease>
168 <latexrelease>\cs_new_protected:Npn \hook_activate_generic:n #1 {}
169 <latexrelease>
170 <latexrelease>\EndIncludeInRelease

```

## 4.5 Parsing a label

`\__hook_parse_label_default:n` This macro checks if a label was given (not `\c_novalue_tl`), and if so, tries to parse the label looking for a leading `.` to replace by `\__hook_currname_or_default:.`

```

171 \cs_new:Npn \__hook_parse_label_default:n #1
172 {
173   \tl_if_novalue:nTF {#1}
174     { \__hook_currname_or_default: }
175     { \tl_trim_spaces_apply:nN {#1} \__hook_parse_dot_label:n }
176 }

```

(End definition for `\__hook_parse_label_default:n`.)

`\__hook_parse_dot_label:n` Start by checking if the label is empty, which raises an error, and uses the fallback value.  
`\__hook_parse_dot_label:w` If not, split the label at a `.`, if any, and check if no tokens are before the `.`, or if the only character is a `..`. If these requirements are fulfilled, the leading `.` is replaced with `\__hook_currname_or_default:.`. Otherwise the label is returned unchanged.  
`\__hook_parse_dot_label_cleanup:w`  
`\__hook_parse_dot_label_aux:w`

```

177 \cs_new:Npn \__hook_parse_dot_label:n #1
178 {
179   \tl_if_empty:nTF {#1}
180   {
181     \msg_expandable_error:nn { hooks } { empty-label }
182     \__hook_currname_or_default:
183   }
184   {
185     \str_if_eq:nnTF {#1} { . }
186     { \__hook_currname_or_default: }
187     { \__hook_parse_dot_label:w #1 ./ \s__hook_mark }
188   }
189 }
190 \cs_new:Npn \__hook_parse_dot_label:w #1 ./ #2 \s__hook_mark

```

```

191 {
192   \tl_if_empty:nTF {#1}
193     { \__hook_parse_dot_label_aux:w #2 \s__hook_mark }
194     {
195       \tl_if_empty:nTF {#2}
196         { \__hook_make_name:n {#1} }
197         { \__hook_parse_dot_label_cleanup:w #1 ./ #2 \s__hook_mark }
198     }
199 }
200 \cs_new:Npn \__hook_parse_dot_label_cleanup:w #1 ./ \s__hook_mark {#1}
201 \cs_new:Npn \__hook_parse_dot_label_aux:w #1 ./ \s__hook_mark
202   { \__hook_currname_or_default: / \__hook_make_name:n {#1} }

```

(End definition for \\_\_hook\_parse\_dot\_label:n and others.)

`\__hook_currname_or_default:` This uses `\g__hook_hook_curr_name_tl` if it is set, otherwise it tries `\@currname`. If neither is set, it raises an error and uses the fallback value `label-missing`.

```

203 \cs_new:Npn \__hook_currname_or_default:
204 {
205   \tl_if_empty:NTF \g__hook_hook_curr_name_tl
206   {
207     \tl_if_empty:NTF \@currname
208     {
209       \msg_expandable_error:nnn { latex2e } { should-not-happen }
210       { Empty~default~label. }
211       \__hook_make_name:n { label-missing }
212     }
213     { \@currname }
214   }
215   { \g__hook_hook_curr_name_tl }
216 }

```

(End definition for \\_\_hook\_currname\_or\_default:.)

`\__hook_make_name:n` This provides a standard sanitization of a hook’s name. It uses `\cs:w` to build a control sequence out of the hook name, then uses `\cs_to_str:N` to get the string representation of that, without the escape character. `\cs:w`-based expansion is used instead of `e`-based because Unicode characters don’t behave well inside `\expanded`. The macro adds the `\_hook_` prefix to the hook name to reuse the hook’s code token list to build the csname and avoid leaving “public” control sequences defined (as `\relax`) in TeX’s memory.

`\__hook_make_name:w`

```

217 \cs_new:Npn \__hook_make_name:n #1
218 {
219   \exp_after:wN \exp_after:wN \exp_after:wN \__hook_make_name:w
220   \exp_after:wN \token_to_str:N \cs:w __hook~ #1 \cs_end:
221 }
222 \exp_last_unbraced:NNNN
223 \cs_new:Npn \__hook_make_name:w #1 \tl_to_str:n { __hook~ } { }

```

(End definition for \\_\_hook\_make\_name:n and \\_\_hook\_make\_name:w.)

`\_hook_normalize_hook_args:Nn` This is the standard route for normalizing hook and label arguments. The main macro does the entire operation within a group so that csnames made by `\__hook_make_name:n` are wiped off before continuing. This means that this function cannot be used for `\hook_use:n!`

`\_hook_normalize_hook_args:Nnn`

`\_hook_normalize_hook_rule_args:Nnnnn`

`\_hook_normalize_hook_args_aux:Nn`

```

224 \cs_new_protected:Npn \__hook_normalize_hook_args_aux:Nn #1 #2
225 {
226   \group_begin:
227   \use:e
228   {
229     \group_end:
230     \exp_not:N #1 #2
231   }
232 }
233 \cs_new_protected:Npn \__hook_normalize_hook_args:Nn #1 #2
234 {
235   \__hook_normalize_hook_args_aux:Nn #1
236   { { \__hook_parse_label_default:n {#2} } }
237 }
238 \cs_new_protected:Npn \__hook_normalize_hook_args:Nnn #1 #2 #3
239 {
240   \__hook_normalize_hook_args_aux:Nn #1
241   {
242     { \__hook_parse_label_default:n {#2} }
243     { \__hook_parse_label_default:n {#3} }
244   }
245 }
246 \cs_new_protected:Npn \__hook_normalize_hook_rule_args:Nnnnn #1 #2 #3 #4 #5
247 {
248   \__hook_normalize_hook_args_aux:Nn #1
249   {
250     { \__hook_parse_label_default:n {#2} }
251     { \__hook_parse_label_default:n {#3} }
252     { \tl_trim_spaces:n {#4} }
253     { \__hook_parse_label_default:n {#5} }
254   }
255 }

```

(End definition for `\__hook_normalize_hook_args:Nn` and others.)

```

\__hook_curr_name_push:n The token list \g__hook_hook_curr_name_tl stores the name of the current pack-
\__hook_curr_name_push_aux:n age/file to be used as the default label in hooks. Providing a consistent interface is
\__hook_curr_name_pop: tricky because packages can be loaded within packages, and some packages may not use
\__hook_end_document_label_check: \SetDefaultHookLabel to change the default label (in which case \@currname is used).

```

To pull that one off, we keep a stack that contains the default label for each level of input. The bottom of the stack contains the default label for the `top-level` (this stack should never go empty). If we're building the format, set the default label to be `top-level`:

```

256 \tl_gset:Nn \g__hook_hook_curr_name_tl { top-level }

```

Then, in case we're in `latexrelease` we push something on the stack to support roll forward. But in some rare cases, `latexrelease` may be loaded inside another package (notably `platexrelease`), so we'll first push the `top-level` entry:

```

257 <latexrelease> \seq_if_empty:NT \g__hook_name_stack_seq
258 <latexrelease> { \seq_gput_right:Nn \g__hook_name_stack_seq { top-level } }

```

then we dissect the `\@currnamestack`, adding `\@currname` to the stack:

```

259 <latexrelease> \cs_set_protected:Npn \__hook_tmp:w #1 #2 #3
260 <latexrelease> {

```

```

261 <latexrelease> \quark_if_recursion_tail_stop:n {#1}
262 <latexrelease> \seq_gput_right:Nn \g__hook_name_stack_seq {#1}
263 <latexrelease> \__hook_tmp:w
264 <latexrelease> }
265 <latexrelease> \exp_after:wN \__hook_tmp:w \@currnamestack
266 <latexrelease> \q_recursion_tail \q_recursion_tail
267 <latexrelease> \q_recursion_tail \q_recursion_stop

```

and finally set the default label to be the \@currname:

```

268 <latexrelease> \tl_gset:Nx \g__hook_hook_curr_name_tl { \@currname }
269 <latexrelease> \seq_gpop_right:NN \g__hook_name_stack_seq \l__hook_tmpa_tl

```

Two commands keep track of the stack: when a file is input, \\_\_hook\_curr\_name\_push:n pushes the current default label onto the stack and sets the new default label (all in one go):

```

270 \cs_new_protected:Npn \__hook_curr_name_push:n #1
271 { \exp_args:Nx \__hook_curr_name_push_aux:n { \__hook_make_name:n {#1} } }
272 \cs_new_protected:Npn \__hook_curr_name_push_aux:n #1
273 {
274   \tl_if_blank:nTF {#1}
275   { \msg_error:nn { hooks } { no-default-label } }
276   {
277     \str_if_eq:nnTF {#1} { top-level }
278     {
279       \msg_error:nnnnn { hooks } { set-top-level }
280       { to } { PushDefaultHookLabel } {#1}
281     }
282     {
283       \seq_gpush:NV \g__hook_name_stack_seq \g__hook_hook_curr_name_tl
284       \tl_gset:Nn \g__hook_hook_curr_name_tl {#1}
285     }
286   }
287 }

```

and when an input is over, the topmost item of the stack is popped, since that label will not be used again, and \g\_\_hook\_hook\_curr\_name\_tl is updated to equal the now topmost item of the stack:

```

288 \cs_new_protected:Npn \__hook_curr_name_pop:
289 {
290   \seq_gpop:NNTF \g__hook_name_stack_seq \l__hook_return_tl
291   { \tl_gset_eq:NN \g__hook_hook_curr_name_tl \l__hook_return_tl }
292   { \msg_error:nn { hooks } { extra-pop-label } }
293 }

```

At the end of the document we want to check if there was no \\_\_hook\_curr\_name\_push:n without a matching \\_\_hook\_curr\_name\_pop: (not a critical error, but it might indicate that something else is not quite right):

```

294 \tl_gput_right:Nn \@kernel@after@enddocument@afterlastpage
295 { \__hook_end_document_label_check: }
296 \cs_new_protected:Npn \__hook_end_document_label_check:
297 {
298   \seq_gpop:NNT \g__hook_name_stack_seq \l__hook_return_tl
299   {
300     \msg_error:nnx { hooks } { missing-pop-label }
301     { \g__hook_hook_curr_name_tl }

```



```

302         \tl_gset_eq:NN \g__hook_hook_curr_name_tl \l__hook_return_tl
303         \__hook_end_document_label_check:
304     }
305 }

```

The token list `\g__hook_hook_curr_name_tl` is but a mirror of the top of the stack.

Now define a wrapper that replaces the top of the stack with the argument, and updates `\g__hook_hook_curr_name_tl` accordingly.

```

306 \cs_new_protected:Npn \__hook_set_default_hook_label:n #1
307 {
308     \seq_if_empty:NTF \g__hook_name_stack_seq
309     {
310         \msg_error:nnnnn { hooks } { set-top-level }
311         { for } { SetDefaultHookLabel } {#1}
312     }
313     { \exp_args:Nx \__hook_set_default_label:n { \__hook_make_name:n {#1} } }
314 }
315 \cs_new_protected:Npn \__hook_set_default_label:n #1
316 {
317     \str_if_eq:nnTF {#1} { top-level }
318     {
319         \msg_error:nnnnn { hooks } { set-top-level }
320         { to } { SetDefaultHookLabel } {#1}
321     }
322     { \tl_gset:Nn \g__hook_hook_curr_name_tl {#1} }
323 }

```

(End definition for `\__hook_curr_name_push:n` and others.)

## 4.6 Adding or removing hook code

`\hook_gput_code:nnn` With `\hook_gput_code:nnn{<hook>}{<label>}{<code>}` a chunk of `<code>` is added to an existing `<hook>` labeled with `<label>`.

```

324 \cs_new_protected:Npn \hook_gput_code:nnn #1 #2
325 { \__hook_normalize_hook_args:Nnn \__hook_gput_code:nnn {#1} {#2} }
326 \cs_new_protected:Npn \__hook_gput_code:nnn #1 #2 #3
327 {

```

First check if the code should be executed immediately, rather than stored:

```

328     \__hook_if_execute_immediately:nTF {#1}
329     {#3}
330     {

```

Then check if the hook is usable.

```

331         \__hook_if_usable:nTF {#1}

```

If so we simply add (or append) the new code to the property list holding different chunks for the hook. At `\begin{document}` this is then sorted into a token list for fast execution.

```

332         {
333             \__hook_hook_gput_code_do:nnn {#1} {#2} {#3}

```

However, if there is an update within the document we need to alter this execution code which is done by `\__hook_update_hook_code:n`. In the preamble this does nothing.

```

334         \__hook_update_hook_code:n {#1}
335     }

```

If the hook is not usable, before giving up, check if it's not disabled and otherwise try to declare it as a generic hook, if its name matches one of the valid patterns.

```

336     {
337         \__hook_if_disabled:nTF {#1}
338         { \msg_error:nnn { hooks } { hook-disabled } {#1} }
339         { \__hook_try_declaring_generic_hook:nnn {#1} {#2} {#3} }
340     }
341 }
342 }

```

This macro will unconditionally add a chunk of code to the given hook.

```

343 \cs_new_protected:Npn \__hook_hook_gput_code_do:nnn #1 #2 #3
344 {

```

However, first some debugging info if debugging is enabled:

```

345     \__hook_debug:n{\iow_term:x{****~ Add~ to~
346                     \__hook_if_usable:nF {#1} { undeclared~ }
347                     hook~ #1~ (#2)
348                     \on@line\space <-- \tl_to_str:n{#3}} }

```

Then try to get the code chunk labeled #2 from the hook. If there's code already there, then append #3 to that, otherwise just put #3. If the current label is `top-level`, the code is added to a dedicated token list `\__hook_toplevel_\hook` that goes at the end of the hook (or at the beginning, for a reversed hook), just before `\__hook_next_\hook`.

```

349     \str_if_eq:nnTF {#2} { top-level }
350     {
351         \str_if_eq:eeTF { top-level } { \__hook_currname_or_default: }
352         {

```

If the hook's basic structure does not exist, we need to declare it with `\__hook_init_structure:n`.

```

353         \__hook_init_structure:n {#1}
354         \__hook_tl_gput_right:cn { __hook_toplevel~#1 } {#3}
355     }
356     { \msg_error:nnn { hooks } { misused-top-level } {#1} }
357 }
358 {
359     \prop_get:cnNTF { g__hook_#1_code_prop } {#2} \l__hook_return_tl
360     {
361         \prop_gput:cno { g__hook_#1_code_prop } {#2}
362         { \l__hook_return_tl #3 }
363     }
364     { \prop_gput:cnn { g__hook_#1_code_prop } {#2} {#3} }
365 }
366 }

```

(End definition for `\hook_gput_code:nnn`, `\__hook_gput_code:nnn`, and `\__hook_hook_gput_code_do:nnn`. This function is documented on page 192.)

`\__hook_gput_undeclared_hook:nnn`

Often it may happen that a package *A* defines a hook `foo`, but package *B*, that adds code to that hook, is loaded before *A*. In such case we need to add code to the hook before its declared.

```

367 \cs_new_protected:Npn \__hook_gput_undeclared_hook:nnn #1 #2 #3
368 {
369     \__hook_init_structure:n {#1}

```

```

370 \__hook_hook_gput_code_do:nnn {#1} {#2} {#3}
371 }

```

(End definition for \\_\_hook\_gput\_undeclared\_hook:nnn.)

```

\__hook_try_declaring_generic_hook:nnn
\__hook_try_declaring_generic_next_hook:nn

```

These entry-level macros just pass the arguments along to the common \\_\_hook\_try\_declaring\_generic\_hook:nNNnn with the right functions to execute when some action is to be taken.

The wrapper \\_\_hook\_try\_declaring\_generic\_hook:nnn then defers \hook\_gput\_code:nnn if the generic hook was declared, or to \\_\_hook\_gput\_undeclared\_hook:nnn otherwise (the hook was tested for existence before, so at this point if it isn't generic, it doesn't exist).

The wrapper \\_\_hook\_try\_declaring\_generic\_next\_hook:nn for next-execution hooks does the same: it defers the code to \hook\_gput\_next\_code:nn if the generic hook was declared, or to \\_\_hook\_gput\_next\_do:nn otherwise.

```

372 <latexrelease>\IncludeInRelease{2021/11/15}{\__hook_try_declaring_generic_hook:nnn}
373 <latexrelease> {Standardise-generic-hook-names}
374 \cs_new_protected:Npn \__hook_try_declaring_generic_hook:nnn #1
375 {
376   \__hook_try_declaring_generic_hook:wTF #1 / / / \scan_stop: {#1}
377   \hook_gput_code:nnn
378   \__hook_gput_undeclared_hook:nnn
379   {#1}
380 }
381 \cs_new_protected:Npn \__hook_try_declaring_generic_next_hook:nn #1
382 {
383   \__hook_try_declaring_generic_hook:wTF #1 / / / \scan_stop: {#1}
384   \hook_gput_next_code:nn
385   \__hook_gput_next_do:nn
386   {#1}
387 }
388 <latexrelease>\EndIncludeInRelease
389 <latexrelease>\IncludeInRelease{2020/10/01}{\__hook_try_declaring_generic_hook:nnn}
390 <latexrelease> {Standardise-generic-hook-names}
391 <latexrelease>\cs_new_protected:Npn \__hook_try_declaring_generic_hook:nnn #1
392 <latexrelease> {
393 <latexrelease>   \__hook_try_declaring_generic_hook:nNNnn {#1}
394 <latexrelease>   \hook_gput_code:nnn \__hook_gput_undeclared_hook:nnn
395 <latexrelease> }
396 <latexrelease>\cs_new_protected:Npn \__hook_try_declaring_generic_next_hook:nn #1
397 <latexrelease> {
398 <latexrelease>   \__hook_try_declaring_generic_hook:nNNnn {#1}
399 <latexrelease>   \hook_gput_next_code:nn \__hook_gput_next_do:nn
400 <latexrelease> }

```

(End definition for \\_\_hook\_try\_declaring\_generic\_hook:nnn and \\_\_hook\_try\_declaring\_generic\_next\_hook:nn.)

```

\__hook_try_declaring_generic_hook:nNNnn
hook_try_declaring_generic_hook_split:nNNnn

```

\\_\_hook\_try\_declaring\_generic\_hook:nNNnn now splits the hook name at the first / (if any) and first checks if it is a file-specific hook (they require some normalization) using \\_\_hook\_if\_file\_hook:wTF. If not then check it is one of a predefined set for generic names. We also split off the second component to see if we have to make a reversed hook. In either case the function returns *<true>* for a generic hook and *<false>* in other cases.

```

401 <latexrelease>\cs_new_protected:Npn \__hook_try_declaring_generic_hook:nNNnn #1
402 <latexrelease> {
403 <latexrelease>   \__hook_if_file_hook:wTF #1 / \s__hook_mark
404 <latexrelease>   {
405 <latexrelease>     \exp_args:Ne \__hook_try_declaring_generic_hook_split:nNNnn
406 <latexrelease>     { \exp_args:Ne \__hook_file_hook_normalize:n {#1} }
407 <latexrelease>   }
408 <latexrelease>   { \__hook_try_declaring_generic_hook_split:nNNnn {#1} }
409 <latexrelease> }

410 <latexrelease>\cs_new_protected:Npn \__hook_try_declaring_generic_hook_split:nNNnn #1 #2 #3
411 <latexrelease> {
412 <latexrelease>   \__hook_try_declaring_generic_hook:wnTF #1 / / / \scan_stop: {#1}
413 <latexrelease>   { #2 }
414 <latexrelease>   { #3 } {#1}
415 <latexrelease> }
416 <latexrelease>\EndIncludeInRelease

```

(End definition for \\_\_hook\_try\_declaring\_generic\_hook:nNNnn and  
\\_\_hook\_try\_declaring\_generic\_hook\_split:nNNnn.)

\\_\_hook\_try\_declaring\_generic\_hook:wnTF

```

417 <latexrelease>\IncludeInRelease{2021/11/15}{\__hook_try_declaring_generic_hook:wn}%
418 <latexrelease>   {Standardise-generic-hook-names}
419 \prg_new_protected_conditional:Npnn \__hook_try_declaring_generic_hook:wn
420   #1 / #2 / #3 / #4 \scan_stop: #5 { TF }
421 {
422   \__hook_if_generic:nTF {#5}
423   {
424     \__hook_if_usable:nF {#5}
425     {

```

If the hook doesn't exist yet we check if it is a cmd hook and if so we attempt patching the command in addition to declaring the hook.

For some commands this will not be possible, in which case \\_\_hook\_patch\_cmd\_-or\_delay:Nnn (defined in ltcmdhooks) will generate an appropriate error message.

```

426       \str_if_eq:nnT {#1} { cmd }
427       { \__hook_try_put_cmd_hook:n {#5} }

```

Declare the hook always even if it can't really be used (error message generated elsewhere).

Here we use \\_\_hook\_make\_usable:n, so that a \hook\_new:n is still possible later.

```

428       \__hook_make_usable:n {#5}
429     }
430     \__hook_if_generic_reversed:nT {#5}
431     { \tl_gset:cn { g__hook_#5_reversed_tl } { - } }
432     \prg_return_true:
433   }
434 {

```

Generic hooks are all named  $\langle type \rangle / \langle name \rangle / \langle place \rangle$ , where  $\langle type \rangle$  and  $\langle place \rangle$  are predefined ( $\backslash c\_hook\_generic\_ \langle type \rangle / . / \langle place \rangle\_tl$ ), and  $\langle name \rangle$  is the variable component. Older releases had some hooks with the  $\langle name \rangle$  in the third part, so the code below supports that syntax for a while, with a warning.

The `\exp_after:wN ... \exp:w` trick is there to remove the conditional structure inserted by `\__hook_try_declaring_generic_hook:wnTF` and thus allow access to the tokens that follow it, as is needed to keep things going.

When the deprecation cycle ends, the lines below should all be replaced by `\prg_return_false:`.

```

435     \__hook_if_deprecated_generic:nTF {#5}
436     {
437         \__hook_deprecated_generic_warn:n {#5}
438         \exp_after:wN \__hook_declare_deprecated_generic:NNn
439         \exp:w % \exp_end:
440     }
441     { \prg_return_false: }
442 }
443 }
```

`\__hook_deprecated_generic_warn:n` will issue a deprecation warning for a given hook, and mark that hook such that the warning will not be issued again (multiple warnings can be issued, but only once per hook).

`\__hook_deprecated_generic_warn:Nn`  
`\__hook_deprecated_generic_warn:Nw`

```

444 \cs_new_protected:Npn \__hook_deprecated_generic_warn:n #1
445 { \__hook_deprecated_generic_warn:w #1 \s__hook_mark }
446 \cs_new_protected:Npn \__hook_deprecated_generic_warn:w
447 #1 / #2 / #3 \s__hook_mark
448 {
449     \if_cs_exist:w __hook~#1/#2/#3 \cs_end: \else:
450         \msg_warning:nnnnn { hooks } { generic-deprecated } {#1} {#2} {#3}
451     \fi:
452     \cs_gset_eq:cN { __hook~#1/#2/#3 } \scan_stop:
453 }
```

Now that the user has been told about the deprecation, we proceed by swapping  $\langle name \rangle$  and  $\langle place \rangle$  and adding the code to the correct hook.

`\__hook_do_deprecated_generic:Nn`  
`\__hook_do_deprecated_generic:Nw`  
`\__hook_declare_deprecated_generic:NNw`  
`\__hook_declare_deprecated_generic:NNw`

```

454 \cs_new_protected:Npn \__hook_do_deprecated_generic:Nn #1 #2
455 { \__hook_do_deprecated_generic:Nw #1 #2 \s__hook_mark }
456 \cs_new_protected:Npn \__hook_do_deprecated_generic:Nw #1
457 #2 / #3 / #4 \s__hook_mark
458 { #1 { #2 / #4 / #3 } }
459 \cs_new_protected:Npn \__hook_declare_deprecated_generic:NNn #1 #2 #3
460 { \__hook_declare_deprecated_generic:NNw #1 #2 #3 \s__hook_mark }
461 \cs_new_protected:Npn \__hook_declare_deprecated_generic:NNw #1 #2
462 #3 / #4 / #5 \s__hook_mark
463 {
464     \__hook_try_declaring_generic_hook:wnTF #3 / #5 / #4 / \scan_stop:
465     { #3 / #5 / #4 }
466     #1 #2 { #3 / #5 / #4 }
467 }
468 \<latexrelease>\EndIncludeInRelease

469 \<latexrelease>\IncludeInRelease{2021/06/01}{\__hook_try_declaring_generic_hook:wn}
470 \<latexrelease> {Support~cmd-hooks}
471 \<latexrelease>\prg_new_protected_conditional:Npnn \__hook_try_declaring_generic_hook:wn
472 \<latexrelease> #1 / #2 / #3 / #4 \scan_stop: #5 { TF }
473 \<latexrelease> {
474 \<latexrelease> \tl_if_empty:nTF {#2}
```

```

475 <latexrelease> { \prg_return_false: }
476 <latexrelease> {
477 <latexrelease> \prop_if_in:NnTF \c__hook_generics_prop {#1}
478 <latexrelease> {
479 <latexrelease> \__hook_if_usable:nF {#5}
480 <latexrelease> {
481 <latexrelease> \str_if_eq:nnT {#1} { cmd }
482 <latexrelease> { \__hook_try_put_cmd_hook:n {#5} }
483 <latexrelease> \__hook_make_usable:n {#5}
484 <latexrelease> }
485 <latexrelease> \prop_if_in:NnTF \c__hook_generics_reversed_ii_prop {#2}
486 <latexrelease> { \tl_gset:cn { g__hook_#5_reversed_tl } { - } }
487 <latexrelease> {
488 <latexrelease> \prop_if_in:NnT \c__hook_generics_reversed_iii_prop {#3}
489 <latexrelease> { \tl_gset:cn { g__hook_#5_reversed_tl } { - } }
490 <latexrelease> }
491 <latexrelease> \prg_return_true:
492 <latexrelease> }
493 <latexrelease> { \prg_return_false: }
494 <latexrelease> }
495 <latexrelease> }
496 <latexrelease> \EndIncludeInRelease

497 <latexrelease> \IncludeInRelease{2020/10/01}{\__hook_try_declaring_generic_hook:wn}%
498 <latexrelease> {Support~cmd-hooks}
499 <latexrelease> \prg_new_protected_conditional:Npnn \__hook_try_declaring_generic_hook:wn
500 <latexrelease> #1 / #2 / #3 / #4 \scan_stop: #5 { TF }
501 <latexrelease> {
502 <latexrelease> \tl_if_empty:nTF {#2}
503 <latexrelease> { \prg_return_false: }
504 <latexrelease> {
505 <latexrelease> \prop_if_in:NnTF \c__hook_generics_prop {#1}
506 <latexrelease> {
507 <latexrelease> \__hook_if_declared:nF {#5} { \hook_new:n {#5} }
508 <latexrelease> \prop_if_in:NnTF \c__hook_generics_reversed_ii_prop {#2}
509 <latexrelease> { \tl_gset:cn { g__hook_#5_reversed_tl } { - } }
510 <latexrelease> {
511 <latexrelease> \prop_if_in:NnT \c__hook_generics_reversed_iii_prop {#3}
512 <latexrelease> { \tl_gset:cn { g__hook_#5_reversed_tl } { - } }
513 <latexrelease> }
514 <latexrelease> \prg_return_true:
515 <latexrelease> }
516 <latexrelease> { \prg_return_false: }
517 <latexrelease> }
518 <latexrelease> }
519 <latexrelease> }
520 <latexrelease> \EndIncludeInRelease

```

(End definition for \\_\_hook\_try\_declaring\_generic\_hook:wnTF and others.)

\\_\_hook\_if\_file\_hook\_p:w \\_\_hook\_if\_file\_hook:wTF checks if the argument is a valid file-specific hook (not, for example, file/before, but file/foo.tex/before). If it is a file-specific hook, then it executes the *<true>* branch, otherwise *<false>*.

```

521 <latexrelease> \IncludeInRelease{2021/11/15}{\__hook_if_file_hook:w}%
522 <latexrelease> {Standardise~generic-hook-names}

```

```

523 \prg_new_conditional:Npnn \__hook_if_file_hook:w
524 #1 / #2 \s__hook_mark #3 { TF }
525 {
526   \__hook_if_generic:nTF {#3}
527   {
528     \str_if_eq:nnTF {#1} { file }
529     { \prg_return_true: }
530     { \prg_return_false: }
531   }
532   { \prg_return_false: }
533 }
534 \<latexrelease>\EndIncludeInRelease

535 \<latexrelease>\IncludeInRelease{2020/10/01}{\__hook_if_file_hook:w}%
536 \<latexrelease>{Standardise-generic-hook-names}
537 \<latexrelease>\prg_new_conditional:Npnn \__hook_if_file_hook:w
538 \<latexrelease>#1 / #2 / #3 \s__hook_mark { TF }
539 \<latexrelease>{
540 \<latexrelease>\str_if_eq:nnTF {#1} { file }
541 \<latexrelease>{
542 \<latexrelease>\bool_lazy_or:nnTF
543 \<latexrelease>{ \tl_if_empty_p:n {#3} }
544 \<latexrelease>{ \str_if_eq_p:nn {#3} { / } }
545 \<latexrelease>{ \prg_return_false: }
546 \<latexrelease>{
547 \<latexrelease>\prop_if_in:NnTF \c__hook_generics_file_prop {#2}
548 \<latexrelease>{ \prg_return_true: }
549 \<latexrelease>{ \prg_return_false: }
550 \<latexrelease>}
551 \<latexrelease>}
552 \<latexrelease>{ \prg_return_false: }
553 \<latexrelease>}
554 \<latexrelease>\EndIncludeInRelease

```

(End definition for \\_\_hook\_if\_file\_hook:wTF.)

\\_\_hook\_file\_hook\_normalize:n

```

\__hook_strip_double_slash:n 555 \<latexrelease>\IncludeInRelease{2021/11/15}{\__hook_file_hook_normalize:n}%
\__hook_strip_double_slash:w 556 \<latexrelease>{Standardise-generic-hook-names}
557 \<latexrelease>\EndIncludeInRelease

```

When a file-specific hook is found, before being declared it is lightly normalized by \\_\_hook\_file\_hook\_normalize:n. The current implementation just replaces two consecutive slashes (//) by a single one, to cope with simple cases where the user did something like \def\input@path{./mypath/}, in which case a hook would have to be \AddToHook{file/./mypath//file.tex/after}.

```

558 \<latexrelease>\IncludeInRelease{2020/10/01}{\__hook_file_hook_normalize:n}%
559 \<latexrelease>{Standardise-generic-hook-names}
560 \<latexrelease>\cs_new:Npn \__hook_file_hook_normalize:n #1
561 \<latexrelease>{ \__hook_strip_double_slash:n {#1} }
562 \<latexrelease>\cs_new:Npn \__hook_strip_double_slash:n #1
563 \<latexrelease>{ \__hook_strip_double_slash:w #1 // \s__hook_mark }

```

This function is always called after testing if the argument is a file hook with \\_\_hook\_if\_file\_hook:wTF, so we can assume it has three parts (it is either file/.../before

or file/.../after), so we use #1/#2/#3 // instead of just #1 // to prevent losing a slash if the file name is empty.

```
564 <latexrelease>\cs_new:Npn \__hook_strip_double_slash:w #1/#2/#3 // #4 \s__hook_mark
565 <latexrelease> {
566 <latexrelease> \tl_if_empty:nTF {#4}
567 <latexrelease> { #1/#2/#3 }
568 <latexrelease> { \__hook_strip_double_slash:w #1/#2/#3 / #4 \s__hook_mark }
569 <latexrelease> }
570 <latexrelease>\EndIncludeInRelease
```

(End definition for \\_\_hook\_file\_hook\_normalize:n, \\_\_hook\_strip\_double\_slash:n, and \\_\_hook\_strip\_double\_slash:w.)

```
\c__hook_generic_cmd/.before_tl
\c__hook_generic_cmd/.after_tl
\c__hook_generic_env/.before_tl
\c__hook_generic_env/.after_tl
\c__hook_generic_file/.before_tl
\c__hook_generic_file/.after_tl
\c__hook_generic_package/.before_tl
\c__hook_generic_package/.after_tl
\c__hook_generic_class/.before_tl
\c__hook_generic_class/.after_tl
\c__hook_generic_include/.before_tl
\c__hook_generic_include/.after_tl
\c__hook_generic_env/.begin_tl
\c__hook_generic_env/.end_tl
\c__hook_generic_include/.end_tl
```

Token lists defining the possible generic hooks. We don't provide any user interface to this as this is meant to be static.

**cmd** The generic hooks used for commands.

**env** The generic hooks used in \begin and \end.

**file, package, class, include** The generic hooks used when loading a file

```
571 <latexrelease>\IncludeInRelease{2021/11/15}{\c__hook_generics_prop}%
572 <latexrelease> {Standardise-generic-hook-names}
573 \clist_map_inline:nn { cmd , env , file , package , class , include }
574 {
575 \tl_const:cn { c__hook_generic_#1/.before_tl } { + }
576 \tl_const:cn { c__hook_generic_#1/.after_tl } { - }
577 }
578 \tl_const:cn { c__hook_generic_env/.begin_tl } { + }
579 \tl_const:cn { c__hook_generic_env/.end_tl } { + }
580 \tl_const:cn { c__hook_generic_include/.end_tl } { - }
581 \tl_const:cn { c__hook_generic_include/.excluded_tl } { + }
```

Deprecated generic hooks:

```
582 \clist_map_inline:nn { file , package , class , include }
583 {
584 \tl_const:cn { c__hook_deprecated_#1/.before_tl } { }
585 \tl_const:cn { c__hook_deprecated_#1/.after_tl } { }
586 }
587 \tl_const:cn { c__hook_deprecated_include/.end_tl } { }
588 <latexrelease>\EndIncludeInRelease
589 <latexrelease>\IncludeInRelease{2020/10/01}{\c__hook_generics_prop}%
590 <latexrelease> {Standardise-generic-hook-names}
591 <latexrelease>\prop_const_from_keyval:Nn \c__hook_generics_prop
592 <latexrelease> {cmd=,env=,file=,package=,class=,include=}
593 <latexrelease>\EndIncludeInRelease
```

(End definition for \c\_\_hook\_generic\_cmd/.before\_tl and others.)

```
\c__hook_generics_reversed_ii_prop
\c__hook_generics_reversed_iii_prop
\c__hook_generics_file_prop
```

The following generic hooks are supposed to use reverse ordering (the ii and iii names are kept for the deprecation cycle):

```
594 <latexrelease>\IncludeInRelease{2021/11/15}{\c__hook_generics_reversed_ii_prop}%
595 <latexrelease> {Standardise-generic-hook-names}
596 <latexrelease>\EndIncludeInRelease
```



```

597 <latexrelease>\IncludeInRelease{2020/10/01}{\c__hook_generics_reversed_ii_prop}%
598 <latexrelease>{Standardise-generic-hook-names}
599 <latexrelease>\prop_const_from_keyval:Nn \c__hook_generics_reversed_ii_prop {after=,end=}
600 <latexrelease>\prop_const_from_keyval:Nn \c__hook_generics_reversed_iii_prop {after=}
601 <latexrelease>\prop_const_from_keyval:Nn \c__hook_generics_file_prop {before=,after=}
602 <latexrelease>\EndIncludeInRelease

```

(End definition for \c\_\_hook\_generics\_reversed\_ii\_prop, \c\_\_hook\_generics\_reversed\_iii\_prop, and \c\_\_hook\_generics\_file\_prop.)

**\hook\_gremove\_code:nn** With \hook\_gremove\_code:nn{<hook>}{<label>} any code for <hook> stored under <label> is removed.

```

603 \cs_new_protected:Npn \hook_gremove_code:nn #1 #2
604 { \__hook_normalize_hook_args:Nnn \__hook_gremove_code:nn {#1} {#2} }
605 \cs_new_protected:Npn \__hook_gremove_code:nn #1 #2
606 {

```

First check that the hook code pool exists. \\_\_hook\_if\_usable:nTF isn't used here because it should be possible to remove code from a hook before its defined (see section 2.1.8).

```

607 \__hook_if_structure_exist:nTF {#1}
608 {

```

Then remove the chunk and run \\_\_hook\_update\_hook\_code:n so that the execution token list reflects the change if we are after \begin{document}.

If all code is to be removed, clear the code pool \g\_\_hook\_<hook>\_code\_prop, the top-level code \\_\_hook\_toplevel\_<hook>, and the next-execution code \\_\_hook\_next\_<hook>.

```

609 \str_if_eq:nnTF {#2} {*}
610 {
611 \prop_gclear:c { g__hook_#1_code_prop }
612 \__hook_tl_gclear:c { __hook_toplevel~#1 }
613 \__hook_tl_gclear:c { __hook_next~#1 }
614 }
615 {

```

If the label is top-level then clear the token list, as all code there is under the same label.

```

616 \str_if_eq:nnTF {#2} { top-level }
617 { \__hook_tl_gclear:c { __hook_toplevel~#1 } }
618 {
619 \prop_gpop:cnNF { g__hook_#1_code_prop } {#2} \l__hook_return_tl
620 { \msg_warning:nnnn { hooks } { cannot-remove } {#1} {#2} }
621 }
622 }

```

Finally update the code, if the hook exists.

```

623 \__hook_if_usable:nT {#1}
624 { \__hook_update_hook_code:n {#1} }
625 }

```

If the code pool for this hook doesn't exist, show a warning:

```

626 {
627 \__hook_if_deprecated_generic:nTF {#1}
628 {
629 \__hook_deprecated_generic_warn:n {#1}

```

```

630         \__hook_do_deprecated_generic:Nn \__hook_gremove_code:nn {#1} {#2}
631     }
632     { \msg_warning:nnnn { hooks } { cannot-remove } {#1} {#2} }
633 }
634 }

```

(End definition for `\hook_gremove_code:nn` and `\__hook_gremove_code:nn`. This function is documented on page 193.)

```

\g__hook_??_code_prop
\__hook-??
\g__hook_??_reversed_tl

```

Initially these variables simply used an empty “label” name (not two question marks). This was a bit unfortunate, because then `l3doc` complains about `__` in the middle of a command name when trying to typeset the documentation. However using a “normal” name such as `default` has the disadvantage of that being not really distinguishable from a real hook name. I now have settled for `??` which needs some gymnastics to get it into the `csname`, but since this is used a lot, the code should be fast, so this is not done with `c` expansion in the code later on.

`\__hook_` isn’t used, but it has to be defined to trick the code into thinking that `??` is actually a hook.

```

635 \prop_new:c {g__hook_??_code_prop}
636 \prop_new:c {_hook-??}

```

Default rules are always given in normal ordering (never in reversed ordering). If such a rule is applied to a reversed hook it behaves as if the rule is reversed (e.g., `after` becomes `before`) because those rules are applied first and then the order is reversed.

```

637 \tl_new:c {g__hook_??_reversed_tl}

```

(End definition for `\g__hook_??_code_prop`, `\__hook-??`, and `\g__hook_??_reversed_tl`.)

## 4.7 Setting rules for hooks code

```

\hook_gset_rule:nnnn
\__hook_gset_rule:nnnn

```

With `\hook_gset_rule:nnnn{<hook>}{<label1>}{<relation>}{<label2>}` a relation is defined between the two code labels for the given `<hook>`. The special hook `??` stands for *any* hook, which sets a default rule (to be used if no other relation between the two hooks exist).

```

638 \cs_new_protected:Npn \hook_gset_rule:nnnn #1#2#3#4
639 {
640     \__hook_normalize_hook_rule_args:Nnnnn \__hook_gset_rule:nnnn
641     {#1} {#2} {#3} {#4}
642 }
643 <latexrelease>\IncludeInRelease{2022/06/01}{\__hook_gset_rule:nnnn}
644 <latexrelease>{Refuse-setting-rule-for-one-time-hooks}
645 \cs_new_protected:Npn \__hook_gset_rule:nnnn #1#2#3#4
646 {
647     \__hook_if_deprecated_generic:nT {#1}
648     {
649         \__hook_deprecated_generic_warn:n {#1}
650         \__hook_do_deprecated_generic:Nn \__hook_gset_rule:nnnn {#1}
651         {#2} {#3} {#4}
652         \__hook_clean_to_scan:w
653     }
654     \__hook_if_execute_immediately:nT {#1}
655     {
656         \msg_error:nnnnnn { hooks } { rule-too-late }

```

```

657         {#1} {#2} {#3} {#4}
658     \__hook_clean_to_scan:w
659 }

```

First we ensure the basic data structure of the hook exists:

```

660 \__hook_init_structure:n {#1}

```

Then we clear any previous relationship between both labels.

```

661 \__hook_rule_gclear:nnn {#1} {#2} {#4}

```

Then we call the function to handle the given rule. Throw an error if the rule is invalid.

```

662 \cs_if_exist_use:CTF { __hook_rule_#3_gset:nnn }
663 {
664     {#1} {#2} {#4}
665     \__hook_update_hook_code:n {#1}
666 }
667 {
668     \msg_error:nnnnnn { hooks } { unknown-rule }
669     {#1} {#2} {#3} {#4}
670 }
671 \s__hook_mark
672 }

673 <latexrelease>\EndIncludeInRelease
674 <latexrelease>\IncludeInRelease{2020/10/01}{\__hook_gset_rule:nnnn}
675 <latexrelease>{Refuse-setting-rule-for-one-time-hooks}
676 <latexrelease>\cs_new_protected:Npn \__hook_gset_rule:nnnn #1#2#3#4
677 <latexrelease> {
678 <latexrelease>     \__hook_if_deprecated_generic:nT {#1}
679 <latexrelease>     {
680 <latexrelease>         \__hook_deprecated_generic_warn:n {#1}
681 <latexrelease>         \__hook_do_deprecated_generic:Nn \__hook_gset_rule:nnnn {#1}
682 <latexrelease>         {#2} {#3} {#4}
683 <latexrelease>         \exp_after:wN \use_none:nnnnnnnnn \use_none:n
684 <latexrelease>     }
685 <latexrelease>     \__hook_init_structure:n {#1}
686 <latexrelease>     \__hook_rule_gclear:nnn {#1} {#2} {#4}
687 <latexrelease>     \cs_if_exist_use:CTF { __hook_rule_#3_gset:nnn }
688 <latexrelease>     {
689 <latexrelease>         {#1} {#2} {#4}
690 <latexrelease>         \__hook_update_hook_code:n {#1}
691 <latexrelease>     }
692 <latexrelease>     {
693 <latexrelease>         \msg_error:nnnnnn { hooks } { unknown-rule }
694 <latexrelease>         {#1} {#2} {#3} {#4}
695 <latexrelease>     }
696 <latexrelease> }
697 <latexrelease>\EndIncludeInRelease

```

(End definition for `\hook_gset_rule:nnnn` and `\__hook_gset_rule:nnnn`. This function is documented on page 193.)

`\__hook_rule_before_gset:nnn` Then we add the new rule. We need to normalize the rules here to allow for faster processing later. Given a pair of labels  $l_A$  and  $l_B$ , the rule  $l_A > l_B$  is the same as  $l_B < l_A$  only presented differently. But by normalizing the forms of the rule to a single representation, say,  $l_B < l_A$ , reduces the time spent looking for the rules later considerably.

`\__hook_rule_after_gset:nnn`

`\__hook_rule_<_gset:nnn`

`\__hook_rule_>_gset:nnn`

Here we do that normalization by using `\(pdf)strcmp` to lexically sort labels  $l_A$  and  $l_B$  to a fixed order. This order is then enforced every time these two labels are used together.

Here we use `\__hook_label_pair:nn`  $\{\langle hook \rangle\} \{\langle l_A \rangle\} \{\langle l_B \rangle\}$  to build a string  $l_B || l_A$  with a fixed order, and use `\__hook_label_ordered:nnTF` to apply the correct rule to the pair of labels, depending if it was sorted or not.

```

698 \cs_new_protected:Npn \__hook_rule_before_gset:nnn #1#2#3
699 {
700   \__hook_tl_gset:cx { g__hook_#1_rule_ \__hook_label_pair:nn {#2} {#3} _tl }
701   { \__hook_label_ordered:nnTF {#2} {#3} { < } { > } }
702 }
703 \cs_new_eq:cN { __hook_rule_<_gset:nnn } \__hook_rule_before_gset:nnn
704 \cs_new_protected:Npn \__hook_rule_after_gset:nnn #1#2#3
705 {
706   \__hook_tl_gset:cx { g__hook_#1_rule_ \__hook_label_pair:nn {#3} {#2} _tl }
707   { \__hook_label_ordered:nnTF {#3} {#2} { < } { > } }
708 }
709 \cs_new_eq:cN { __hook_rule_>_gset:nnn } \__hook_rule_after_gset:nnn

```

(End definition for `\__hook_rule_before_gset:nnn` and others.)

`\__hook_rule_voids_gset:nnn` This rule removes (clears, actually) the code from label #3 if label #2 is in the hook #1.

```

710 \cs_new_protected:Npn \__hook_rule_voids_gset:nnn #1#2#3
711 {
712   \__hook_tl_gset:cx { g__hook_#1_rule_ \__hook_label_pair:nn {#2} {#3} _tl }
713   { \__hook_label_ordered:nnTF {#2} {#3} { -> } { <- } }
714 }

```

(End definition for `\__hook_rule_voids_gset:nnn`.)

`\__hook_rule_incompatible-error_gset:nnn` These relations make an error/warning if labels #2 and #3 appear together in hook #1.

```

\__hook_rule_incompatible-warning_gset:nnn
715 \cs_new_protected:cpn { __hook_rule_incompatible-error_gset:nnn } #1#2#3
716 { \__hook_tl_gset:cn { g__hook_#1_rule_ \__hook_label_pair:nn {#2} {#3} _tl }
717   { xE } }
718 \cs_new_protected:cpn { __hook_rule_incompatible-warning_gset:nnn } #1#2#3
719 { \__hook_tl_gset:cn { g__hook_#1_rule_ \__hook_label_pair:nn {#2} {#3} _tl }
720   { xW } }

```

(End definition for `\__hook_rule_incompatible-error_gset:nnn` and `\__hook_rule_incompatible-warning_gset:nnn`.)

`\__hook_rule_unrelated_gset:nnn` Undo a setting. `\__hook_rule_unrelated_gset:nnn` doesn't need to do anything, since we use `\__hook_rule_gclear:nnn` before setting any rule.

```

\__hook_rule_gclear:nnn
721 \cs_new_protected:Npn \__hook_rule_unrelated_gset:nnn #1#2#3 { }
722 \cs_new_protected:Npn \__hook_rule_gclear:nnn #1#2#3
723 { \cs_undefine:c { g__hook_#1_rule_ \__hook_label_pair:nn {#2} {#3} _tl } }

```

(End definition for `\__hook_rule_unrelated_gset:nnn` and `\__hook_rule_gclear:nnn`.)

`\__hook_label_pair:nn` Ensure that the lexically greater label comes first.

```

724 \cs_new:Npn \__hook_label_pair:nn #1#2
725 {
726   \if_case:w \__hook_str_compare:nn {#1} {#2} \exp_stop_f:
727     #1 | #1 % 0

```

```

728 \or: #1 | #2 % +1
729 \else: #2 | #1 % -1
730 \fi:
731 }

```

(End definition for `\__hook_label_pair:nn`.)

`\__hook_label_ordered_p:nn` Check that labels #1 and #2 are in the correct order (as returned by `\__hook_label_pair:nn`) and if so return true, else return false.

```

732 \prg_new_conditional:Npnn \__hook_label_ordered:nn #1#2 { TF }
733 {
734   \if_int_compare:w \__hook_str_compare:nn {#1} {#2} > 0 \exp_stop_f:
735   \prg_return_true:
736   \else:
737   \prg_return_false:
738   \fi:
739 }

```

(End definition for `\__hook_label_ordered:nnTF`.)

`\__hook_if_label_case:nnnnn` To avoid doing the string comparison twice in `\__hook_initialize_single:NNn` (once with `\str_if_eq:nn` and again with `\__hook_label_ordered:nn`), we use a three-way branching macro that will compare #1 and #2 and expand to `\use_i:nnn` if they are equal, `\use_ii:nn` if #1 is lexically greater, and `\use_iii:nn` otherwise.

```

740 \cs_new:Npn \__hook_if_label_case:nnnnn #1#2
741 {
742   \cs:w use_
743   \if_case:w \__hook_str_compare:nn {#1} {#2}
744   i \or: ii \else: iii \fi: :nnn
745   \cs_end:
746 }

```

(End definition for `\__hook_if_label_case:nnnnn`.)

`\__hook_update_hook_code:n` Before `\begin{document}` this does nothing, in the body it reinitializes the hook code using the altered data.

```

747 \cs_new_eq:NN \__hook_update_hook_code:n \use_none:n

```

(End definition for `\__hook_update_hook_code:n`.)

`\__hook_initialize_all:` Initialize all known hooks (at `\begin{document}`), i.e., update the fast execution token lists to hold the necessary code in the right order.

```

748 \cs_new_protected:Npn \__hook_initialize_all: {

```

First we change `\__hook_update_hook_code:n` which so far was a no-op to now initialize one hook. This way any later updates to the hook will run that code and also update the execution token list.

```

749   \cs_gset_eq:NN \__hook_update_hook_code:n \__hook_initialize_hook_code:n

```

Now we loop over all hooks that have been defined and update each of them.

```

750   \__hook_debug:n { \prop_gclear:N \g__hook_used_prop }
751   \seq_map_inline:Nn \g__hook_all_seq
752   {
753     \__hook_update_hook_code:n {##1}
754   }

```

If we are debugging we show results hook by hook for all hooks that have data.

```

755 \__hook_debug:n
756 { \iow_term:x{^^JAll~ initialized~ (non-empty)~ hooks:}
757   \prop_map_inline:Nn \g__hook_used_prop
758   { \iow_term:x{^^J~ ##1~ ->~
759     \exp_not:v {\__hook~##1}~ }
760   }
761 }

```

After all hooks are initialized we change the “use” to just call the hook code and not initialize it (as it was done in the preamble.

```

762 \cs_gset_eq:NN \hook_use:n \__hook_use_initialized:n
763 \cs_gset_eq:NN \__hook_preamble_hook:n \use_none:n
764 }

```

(End definition for \\_\_hook\_initialize\_all:.)

\\_\_hook\_initialize\_hook\_code:n

Initializing or reinitializing the fast execution hook code. In the preamble this is selectively done in case a hook gets used and at \begin{document} this is done for all hooks and afterwards only if the hook code changes.

```

765 \cs_new_protected:Npn \__hook_initialize_hook_code:n #1
766 {
767   \__hook_debug:n
768   { \iow_term:x { ^^J Update~code~for~hook~'##1' \on@line :^^J } }

```

This does the sorting and the updates. First thing we do is to check if a legacy hook macro exists and if so we add it to the hook under the label `legacy`. This might make the hook non-empty so we have to do this before the then following test.

```

769 \__hook_include_legacy_code_chunk:n {#1}

```

If there aren’t any code chunks for the current hook, there is no point in even starting the sorting routine so we make a quick test for that and in that case just update \\_\_hook\_⟨hook⟩ to hold the top-level and next code chunks. If there are code chunks we call \\_\_hook\_initialize\_single:NNn and pass to it ready made csnames as they are needed several times inside. This way we save a bit on processing time if we do that up front.

```

770 \__hook_if_usable:nT {#1}
771 {
772   \prop_if_empty:cTF { g__hook_#1_code_prop }
773   {
774     \__hook_tl_gset:co { __hook~#1 }
775     {
776       \cs:w __hook_toplevel~#1 \exp_after:wN \cs_end:
777       \cs:w __hook_next~#1 \cs_end:
778     }
779   }
780 {

```

By default the algorithm sorts the code chunks and then saves the result in a token list for fast execution; this is done by adding the code chunks one after another, using \tl\_gput\_right:NV. When we sort code for a reversed hook, all we have to do is to add the code chunks in the opposite order into the token list. So all we have to do in preparation is to change two definitions that are used later on.

```

781 \__hook_if_reversed:nTF {#1}

```

```

782         { \cs_set_eq:NN \__hook_tl_gput:Nn \__hook_tl_gput_left:Nn
783           \cs_set_eq:NN \__hook_clist_gput:NV \clist_gput_left:NV }
784         { \cs_set_eq:NN \__hook_tl_gput:Nn \__hook_tl_gput_right:Nn
785           \cs_set_eq:NN \__hook_clist_gput:NV \clist_gput_right:NV }

```

When sorting, some relations (namely `voids`) need to act destructively on the code property lists to remove code that shouldn't appear in the sorted hook token list, so we make a copy of the code property list that we can safely work on without changing the main one.

```

786         \prop_set_eq:Nc \l__hook_work_prop { g__hook_#1_code_prop }
787         \__hook_initialize_single:ccn
788         { __hook-#1 } { g__hook_#1_labels_clist } {#1}

```

For debug display we want to keep track of those hooks that actually got code added to them, so we record that in `plist`. We use a `plist` to ensure that we record each hook name only once, i.e., we are only interested in storing the keys and the value is arbitrary.

```

789         \__hook_debug:n
790         { \exp_args:NNx \prop_gput:Nnn \g__hook_used_prop {#1} { } }
791     }
792 }
793 }

```

(End definition for `\__hook_initialize_hook_code:n`.)

`\__hook_tl_csname:n` It is faster to pass a single token and expand it when necessary than to pass a bunch of  
`\__hook_seq_csname:n` character tokens around.

*FMi: note to myself: verify*

```

794 \cs_new:Npn \__hook_tl_csname:n #1 { l__hook_label_#1_tl }
795 \cs_new:Npn \__hook_seq_csname:n #1 { l__hook_label_#1_seq }

```

(End definition for `\__hook_tl_csname:n` and `\__hook_seq_csname:n`.)

`\l__hook_labels_seq` For the sorting I am basically implementing Knuth's algorithm for topological sorting as  
`\l__hook_labels_int` given in TAOCP volume 1 pages 263–266. For this algorithm we need a number of local  
`\l__hook_front_tl` variables:

- List of labels used in the current hook to label code chunks:

```

796         \seq_new:N \l__hook_labels_seq

```

- Number of labels used in the current hook. In Knuth's algorithm this is called  $N$ :

```

797         \int_new:N \l__hook_labels_int

```

- The sorted code list to be build is managed using two pointers one to the front of the queue and one to the rear. We model this using token list pointers. Knuth calls them  $F$  and  $R$ :

```

798         \tl_new:N \l__hook_front_tl
799         \tl_new:N \l__hook_rear_tl

```

- The data for the start of the queue is kept in this token list, it corresponds to what Don calls `QLINK[0]` but since we aren't manipulating individual words in memory it is slightly differently done:

```
800      \tl_new:c { \__hook_tl_csname:n { 0 } }
```

(End definition for `\l__hook_labels_seq` and others.)

`\__hook_initialize_single:NNn` implements the sorting of the code chunks for a hook and saves the result in the token list for fast execution (#4). The arguments are  $\langle hook-code-plist \rangle$ ,  $\langle hook-code-tl \rangle$ ,  $\langle hook-top-level-code-tl \rangle$ ,  $\langle hook-next-code-tl \rangle$ ,  $\langle hook-ordered-labels-clist \rangle$  and  $\langle hook-name \rangle$  (the latter is only used for debugging—the  $\langle hook-rule-plist \rangle$  is accessed using the  $\langle hook-name \rangle$ ).

The additional complexity compared to Don's algorithm is that we do not use simple positive integers but have arbitrary alphanumeric labels. As usual Don's data structures are chosen in a way that one can omit a lot of tests and I have mimicked that as far as possible. The result is a restriction I do not test for at the moment: a label can't be equal to the number 0!

*FMi: Needs checking for, just in case ... maybe*

```
801 \cs_new_protected:Npn \__hook_initialize_single:NNn #1#2#3
802 {
```

Step T1: Initialize the data structure ...

```
803   \seq_clear:N \l__hook_labels_seq
804   \int_zero:N \l__hook_labels_int
```

Store the name of the hook:

```
805   \tl_set:Nn \l__hook_cur_hook_tl {#3}
```

We loop over the property list holding the code and record all the labels listed there. Only the rules for those labels are of interest to us. While we are at it we count them (which gives us the  $N$  in Knuth's algorithm). The prefix `label_` is added to the variables to ensure that labels named `front`, `rear`, `labels`, or `return` don't interact with our code.

```
806   \prop_map_inline:Nn \l__hook_work_prop
807   {
808     \int_incr:N \l__hook_labels_int
809     \seq_put_right:Nn \l__hook_labels_seq {##1}
810     \__hook_tl_set:cn { \__hook_tl_csname:n {##1} } { 0 }
811     \seq_clear_new:c { \__hook_seq_csname:n {##1} }
812   }
```

Steps T2 and T3: Here we sort the relevant rules into the data structure...

This loop constitutes a square matrix of the labels in `\l__hook_work_prop` in the vertical and the horizontal directions. However, since the rule  $l_A \langle rel \rangle l_B$  is the same as  $l_B \langle rel \rangle^{-1} l_A$  we can cut the loop short at the diagonal of the matrix (*i.e.*, when both labels are equal), saving a good amount of time. The way the rules were set up (see the implementation of `\__hook_rule_before_gset:nnn` above) ensures that we have no rule in the ignored side of the matrix, and all rules are seen. The rules are applied in `\__hook_apply_label_pair:nnn`, which takes the properly-ordered pair of labels as argument.

```
813   \prop_map_inline:Nn \l__hook_work_prop
814   {
```



```

815     \prop_map_inline:Nn \l__hook_work_prop
816     {
817         \__hook_if_label_case:nnnnn {##1} {####1}
818         { \prop_map_break: }
819         { \__hook_apply_label_pair:nnn {##1} {####1} }
820         { \__hook_apply_label_pair:nnn {####1} {##1} }
821         {#3}
822     }
823 }

```

Now take a breath, and look at the data structures that have been set up:

```

824 \__hook_debug:n { \__hook_debug_label_data:N \l__hook_work_prop }

```

Step T4:

```

825 \tl_set:Nn \l__hook_rear_tl { 0 }
826 \tl_set:cn { \__hook_tl_csname:n { 0 } } { 0 }
827 \seq_map_inline:Nn \l__hook_labels_seq
828 {
829     \int_compare:nNnT { \cs:w \__hook_tl_csname:n {##1} \cs_end: } = 0
830     {
831         \tl_set:cn { \__hook_tl_csname:n { \l__hook_rear_tl } } {##1}
832         \tl_set:Nn \l__hook_rear_tl {##1}
833     }
834 }
835 \tl_set_eq:Nc \l__hook_front_tl { \__hook_tl_csname:n { 0 } }
836 \__hook_tl_gclear:N #1
837 \clist_gclear:N #2

```

The whole loop gets combined in steps T5–T7:

```

838 \bool_while_do:nn { ! \str_if_eq_p:Vn \l__hook_front_tl { 0 } }
839 {

```

This part is step T5:

```

840     \int_decr:N \l__hook_labels_int
841     \prop_get:NVN \l__hook_work_prop \l__hook_front_tl \l__hook_return_tl
842     \exp_args:NNV \__hook_tl_gput:Nn #1 \l__hook_return_tl
843     \__hook_clist_gput:NV #2 \l__hook_front_tl
844     \__hook_debug:n{ \iow_term:x{Handled~ code~ for~ \l__hook_front_tl} }

```

This is step T6, except that we don't use a pointer *P* to move through the successors, but instead use ##1 of the mapping function.

```

845     \seq_map_inline:cn { \__hook_seq_csname:n { \l__hook_front_tl } }
846     {
847         \tl_set:cx { \__hook_tl_csname:n {##1} }
848             { \int_eval:n
849                 { \cs:w \__hook_tl_csname:n {##1} \cs_end: - 1 }
850             }
851         \int_compare:nNnT
852             { \cs:w \__hook_tl_csname:n {##1} \cs_end: } = 0
853             {
854                 \tl_set:cn { \__hook_tl_csname:n { \l__hook_rear_tl } } {##1}
855                 \tl_set:Nn \l__hook_rear_tl {##1}
856             }
857     }

```

and here is step T7:

```
858      \tl_set_eq:Nc \l__hook_front_tl
859      { \__hook_tl_csname:n { \l__hook_front_tl } }
```

This is step T8: If we haven't moved the code for all labels (i.e., if `\l__hook_labels_int` is still greater than zero) we have a loop and our partial order can't be flattened out.

```
860    }
861    \int_compare:nNnF \l__hook_labels_int = 0
862    {
863      \iow_term:x{=====}
864      \iow_term:x{Error:~ label~ rules~ are~ incompatible:}
```

This is not really the information one needs in the error case but it will do for now

...

*FMi: improve output on a rainy day*

```
865      \__hook_debug_label_data:N \l__hook_work_prop
866      \iow_term:x{=====}
867    }
```

After we have added all hook code to #1, we finish it off by adding extra code for the `top-level` (#2) and for one time execution (#3). These should normally be empty. The `top-level` code is added with `\__hook_tl_gput:Nn` as that might change for a reversed hook (then `top-level` is the very first code chunk added). The `next` code is always added last.

```
868      \exp_args:NNo \__hook_tl_gput:Nn #1 { \cs:w __hook_toplevel~#3 \cs_end: }
869      \__hook_tl_gput_right:No #1 { \cs:w __hook_next~#3 \cs_end: }
870    }
871 \cs_generate_variant:Nn \__hook_initialize_single:NNn { cc }
```

(End definition for `\__hook_initialize_single:NNn`.)

`\__hook_tl_gput:Nn` and `\__hook_clist_gput:Nv` These append either on the right (normal hook) or on the left (reversed hook). This is setup up in `\__hook_initialize_hook_code:n`, elsewhere their behavior is undefined.

```
872 \cs_new:Npn \__hook_tl_gput:Nn { \ERROR }
873 \cs_new:Npn \__hook_clist_gput:Nv { \ERROR }
```

(End definition for `\__hook_tl_gput:Nn` and `\__hook_clist_gput:Nv`.)

`\__hook_apply_label_pair:nnn` and `\__hook_label_if_exist_apply:nnnF` This is the payload of steps T2 and T3 executed in the loop described above. This macro assumes #1 and #2 are ordered, which means that any rule pertaining the pair #1 and #2 is `\g__hook_<hook>_rule_#1|#2_tl`, and not `\g__hook_<hook>_rule_#2|#1_tl`. This also saves a great deal of time since we only need to check the order of the labels once.

The arguments here are `<label1>`, `<label2>`, `<hook>`, and `<hook-code-plist>`. We are about to apply the next rule and enter it into the data structure. `\__hook_apply_label_pair:nnn` will just call `\__hook_label_if_exist_apply:nnnF` for the `<hook>`, and if no rule is found, also try the `<hook>` name ?? denoting a default hook rule.

`\__hook_label_if_exist_apply:nnnF` will check if the rule exists for the given hook, and if so call `\__hook_apply_rule:nnn`.

```
874 \cs_new_protected:Npn \__hook_apply_label_pair:nnn #1#2#3
875 {
```

Extra complication: as we use default rules and local hook specific rules we first have to check if there is a local rule and if that exist use it. Otherwise check if there is a default rule and use that.

```
876 \__hook_label_if_exist_apply:nnnF {#1} {#2} {#3}
877 {
```

If there is no hook-specific rule we check for a default one and use that if it exists.

```
878 \__hook_label_if_exist_apply:nnnF {#1} {#2} { ?? } { }
879 }
880 }
```

```
881 \cs_new_protected:Npn \__hook_label_if_exist_apply:nnnF #1#2#3
882 {
883 \if_cs_exist:w g__hook_ #3 _rule_ #1 | #2 _tl \cs_end:
```

What to do precisely depends on the type of rule we have encountered. If it is a **before** rule it will be handled by the algorithm but other types need to be managed differently. All this is done in `\__hook_apply_rule:nnnN`.

```
884 \__hook_apply_rule:nnn {#1} {#2} {#3}
885 \exp_after:wN \use_none:n
886 \else:
887 \use:nn
888 \fi:
889 }
```

(End definition for `\__hook_apply_label_pair:nnn` and `\__hook_label_if_exist_apply:nnnF`.)

`\__hook_apply_rule:nnn` This is the code executed in steps T2 and T3 while looping through the matrix This is part of step T3. We are about to apply the next rule and enter it into the data structure. The arguments are  $\langle label1 \rangle$ ,  $\langle label2 \rangle$ ,  $\langle hook-name \rangle$ , and  $\langle hook-code-plist \rangle$ .

```
890 \cs_new_protected:Npn \__hook_apply_rule:nnn #1#2#3
891 {
892 \cs:w __hook_apply_
893 \cs:w g__hook_#3_reversed_tl \cs_end: rule_
894 \cs:w g__hook_ #3 _rule_ #1 | #2 _tl \cs_end: :nnn \cs_end:
895 {#1} {#2} {#3}
896 }
```

(End definition for `\__hook_apply_rule:nnn`.)

`\__hook_apply_rule_<:nnn` The most common cases are `<` and `>` so we handle that first. They are relations `<` and `>` in TAOCP, and they dictate sorting.

```
\__hook_apply_rule_>:nnn
897 \cs_new_protected:cpn { __hook_apply_rule_<:nnn } #1#2#3
898 {
899 \__hook_debug:n { \__hook_msg_pair_found:nnn {#1} {#2} {#3} }
900 \tl_set:cx { \__hook_tl_csname:n {#2} }
901 { \int_eval:n{ \cs:w \__hook_tl_csname:n {#2} \cs_end: + 1 } }
902 \seq_put_right:cn{ \__hook_seq_csname:n {#1} }{#2}
903 }
904 \cs_new_protected:cpn { __hook_apply_rule_>:nnn } #1#2#3
905 {
906 \__hook_debug:n { \__hook_msg_pair_found:nnn {#1} {#2} {#3} }
907 \tl_set:cx { \__hook_tl_csname:n {#1} }
908 { \int_eval:n{ \cs:w \__hook_tl_csname:n {#1} \cs_end: + 1 } }
909 \seq_put_right:cn{ \__hook_seq_csname:n {#2} }{#1}
910 }
```

(End definition for `\__hook_apply_rule_<:nnn` and `\__hook_apply_rule_>:nnn`.)

`\__hook_apply_rule_xE:nnn` These relations make two labels incompatible within a hook. `xE` makes raises an error if the labels are found in the same hook, and `xW` makes it a warning.

`\__hook_apply_rule_xW:nnn`

```

911 \cs_new_protected:cpn { __hook_apply_rule_xE:nnn } #1#2#3
912 {
913   \__hook_debug:n { \__hook_msg_pair_found:nnn {#1} {#2} {#3} }
914   \msg_error:nnnnnn { hooks } { labels-incompatible }
915   {#1} {#2} {#3} { 1 }
916   \use:c { __hook_apply_rule_>:nnn } {#1} {#2} {#3}
917   \use:c { __hook_apply_rule_<:nnn } {#1} {#2} {#3}
918 }
919 \cs_new_protected:cpn { __hook_apply_rule_xW:nnn } #1#2#3
920 {
921   \__hook_debug:n { \__hook_msg_pair_found:nnn {#1} {#2} {#3} }
922   \msg_warning:nnnnnn { hooks } { labels-incompatible }
923   {#1} {#2} {#3} { 0 }
924 }
```

(End definition for `\__hook_apply_rule_xE:nnn` and `\__hook_apply_rule_xW:nnn`.)

`\__hook_apply_rule_>:nnn`

`\__hook_apply_rule_<:nnn`

If we see `->` we have to drop code for label `#3` and carry on. We could do a little better and drop everything for that label since it doesn't matter where we put such empty code. However that would complicate the algorithm a lot with little gain.<sup>10</sup> So we still unnecessarily try to sort it in and depending on the rules that might result in a loop that is otherwise resolved. If that turns out to be a real issue, we can improve the code.

Here the code is removed from `\l__hook_cur_hook_tl` rather than `#3` because the latter may be `??`, and the default hook doesn't store any code. Removing it instead from `\l__hook_cur_hook_tl` makes the default rules `->` and `<-` work properly.

```

925 \cs_new_protected:cpn { __hook_apply_rule_>:nnn } #1#2#3
926 {
927   \__hook_debug:n
928   {
929     \__hook_msg_pair_found:nnn {#1} {#2} {#3}
930     \iow_term:x{--->~ Drop~ '#2'~ code~ from~
931       \iow_char:N \ g__hook_ \l__hook_cur_hook_tl _code_prop ~
932       because~ of~ '#1' }
933   }
934   \prop_put:Nnn \l__hook_work_prop {#2} { }
935 }
936 \cs_new_protected:cpn { __hook_apply_rule_<:nnn } #1#2#3
937 {
938   \__hook_debug:n
939   {
940     \__hook_msg_pair_found:nnn {#1} {#2} {#3}
941     \iow_term:x{--->~ Drop~ '#1'~ code~ from~
942       \iow_char:N \ g__hook_ \l__hook_cur_hook_tl _code_prop ~
943       because~ of~ '#2' }
944   }
945   \prop_put:Nnn \l__hook_work_prop {#1} { }
946 }
```

<sup>10</sup>This also has the advantage that the result of the sorting doesn't change, as it might otherwise do (for unrelated chunks) if we aren't careful.

(End definition for `\_hook_apply_rule->:nnn` and `\_hook_apply_rule<=:nnn`.)

```

\_hook_apply_rule<:nnn      Reversed rules.
\_hook_apply_rule>:nnn      947 \cs_new_eq:cc { \_hook_apply_rule<:nnn } { \_hook_apply_rule>:nnn }
\_hook_apply_rule<=:nnn      948 \cs_new_eq:cc { \_hook_apply_rule>:nnn } { \_hook_apply_rule<:nnn }
\_hook_apply_rule->:nnn      949 \cs_new_eq:cc { \_hook_apply_rule<=:nnn } { \_hook_apply_rule->:nnn }
\_hook_apply_rule_xW:nnn      950 \cs_new_eq:cc { \_hook_apply_rule->:nnn } { \_hook_apply_rule_xW:nnn }
\_hook_apply_rule_xE:nnn      951 \cs_new_eq:cc { \_hook_apply_rule_xE:nnn } { \_hook_apply_rule_xE:nnn }
                               952 \cs_new_eq:cc { \_hook_apply_rule_xW:nnn } { \_hook_apply_rule_xW:nnn }

```

(End definition for `\_hook_apply_rule<:nnn` and others.)

```

\_hook_msg_pair_found:nnn    A macro to avoid moving this many tokens around.
                               953 \cs_new_protected:Npn \_hook_msg_pair_found:nnn #1#2#3
                               954 {
                               955     \iow_term:x{~ \str_if_eq:nnTF {#3} {??} {default} {~normal} ~
                               956         rule~ \_hook_label_pair:nn {#1} {#2}:~
                               957         \use:c { g\_hook\_#3\_rule \_hook_label_pair:nn {#1} {#2} _tl } ~
                               958         found}
                               959 }

```

(End definition for `\_hook_msg_pair_found:nnn`.)

```

\_hook_debug_label_data:N
                               960 \cs_new_protected:Npn \_hook_debug_label_data:N #1 {
                               961     \iow_term:x{Code~ labels~ for~ sorting:}
                               962     \iow_term:x{~ \seq_use:Nnnn\l\_hook_labels_seq {~and~}{,~}{~and~} }
                               963     \iow_term:x{^^J Data~ structure~ for~ label~ rules:}
                               964     \prop_map_inline:Nn #1
                               965     {
                               966         \iow_term:x{~ ##1~ =~ \tl_use:c{ \_hook_tl_csname:n {##1} }~ ->~
                               967         \seq_use:cnnn{ \_hook_seq_csname:n {##1} }{~>~}{~>~}{~>~}
                               968     }
                               969 }
                               970 \iow_term:x{}
                               971 }

```

(End definition for `\_hook_debug_label_data:N`.)

**`\hook_show:n`** This writes out information about the hook given in its argument onto the `.log` file and the terminal, if `\show_hook:n` is used. Internally both share the same structure, except that at the end, `\hook_show:n` triggers TeX's prompt.

```

\_hook_log_line:x
\_hook_log_line_indent:x
\_hook_log:nN
                               972 \cs_new_protected:Npn \hook_log:n #1
                               973 {
                               974     \cs_set_eq:NN \_hook_log_cmd:x \iow_log:x
                               975     \_hook_normalize_hook_args:Nn \_hook_log:nN {#1} \tl_log:x
                               976 }
                               977 \cs_new_protected:Npn \hook_show:n #1
                               978 {
                               979     \cs_set_eq:NN \_hook_log_cmd:x \iow_term:x
                               980     \_hook_normalize_hook_args:Nn \_hook_log:nN {#1} \tl_show:x
                               981 }
                               982 \cs_new_protected:Npn \_hook_log_line:x #1
                               983 { \_hook_log_cmd:x { >~#1 } }
                               984 \cs_new_protected:Npn \_hook_log_line_indent:x #1
                               985 { \_hook_log_cmd:x { >~\@spaces #1 } }

```

```

986 \cs_new_protected:Npn \__hook_log:nN #1 #2
987 {
988   \__hook_if_deprecated_generic:nT {#1}
989   {
990     \__hook_deprecated_generic_warn:n {#1}
991     \__hook_do_deprecated_generic:Nn \__hook_log:nN {#1} #2
992     \exp_after:wN \use_none:nnnnnnnnn \use_none:nnnnn
993   }
994   \__hook_preamble_hook:n {#1}
995   \__hook_log_cmd:x
996   { ^^J ->~The~ \__hook_if_generic:nT {#1} { generic~ } hook~'#1': }
997   \__hook_if_usable:nF {#1}
998   { \__hook_log_line:x { The~hook~is~not~declared. } }
999   \__hook_if_disabled:nT {#1}
1000   { \__hook_log_line:x { The~hook~is~disabled. } }
1001   \hook_if_empty:nTF {#1}
1002   { #2 { The~hook~is~empty } }
1003   {
1004     \__hook_log_line:x { Code~chunks: }
1005     \prop_if_empty:cTF { g__hook_#1_code_prop }
1006     { \__hook_log_line_indent:x { --- } }
1007     {
1008       \prop_map_inline:cn { g__hook_#1_code_prop }
1009       { \__hook_log_line_indent:x { ##1~->~\tl_to_str:n {##2} } }
1010     }
1011   }

```

If there is code in the top-level token list, print it:

```

1011   \__hook_log_line:x
1012   {
1013     Document-level~(top-level)~code
1014     \__hook_if_usable:nT {#1}
1015     { ~(executed~\__hook_if_reversed:nTF {#1} {first} {last} ) } :
1016   }
1017   \__hook_log_line_indent:x
1018   {
1019     \tl_if_empty:cTF { __hook_toplevel~#1 }
1020     { --- }
1021     { -> ~ \exp_args:Nv \tl_to_str:n { __hook_toplevel~#1 } }
1022   }
1023   \__hook_log_line:x { Extra-code-for-next-invocation: }
1024   \__hook_log_line_indent:x
1025   {
1026     \tl_if_empty:cTF { __hook_next~#1 }
1027     { --- }

```

If the token list is not empty we want to display it but without the first tokens (the code to clear itself) so we call a helper command to get rid of them.

```

1028     { ->~ \exp_args:Nv \__hook_log_next_code:n { __hook_next~#1 } }
1029   }

```

Loop through the rules in a hook and for every rule found, print it. If no rule is there, print ---. The boolean \l\_\_hook\_tmpa\_bool here indicates if the hook has no rules.

```

1030   \__hook_log_line:x { Rules: }

```

```

1031     \bool_set_true:N \l__hook_tmpa_bool
1032     \__hook_list_rules:nn {#1}
1033     {
1034         \bool_set_false:N \l__hook_tmpa_bool
1035         \__hook_log_line_indent:x
1036         {
1037             ##2~ with~
1038             \str_if_eq:nnT {##3} {??} { default~ }
1039             relation~ ##1
1040         }
1041     }
1042     \bool_if:NT \l__hook_tmpa_bool
1043     { \__hook_log_line_indent:x { --- } }

```

When the hook is declared (that is, the sorting algorithm is applied to that hook) and not empty

```

1044     \bool_lazy_and:nnTF
1045     { \__hook_if_usable_p:n {#1} }
1046     { ! \hook_if_empty_p:n {#1} }
1047     {
1048         \__hook_log_line:x
1049         {
1050             Execution~order
1051             \bool_if:NTF \l__hook_tmpa_bool
1052             { \__hook_if_reversed:nT {#1} { ~(after~reversal) } }
1053             { ~(after~
1054                 \__hook_if_reversed:nT {#1} { reversal~and~ }
1055                 applying~rules)
1056             } :
1057         }
1058         #2 % \tl_show:n
1059         {
1060             \@spaces
1061             \clist_if_empty:cTF { g__hook_#1_labels_clist }
1062             { --- }
1063             { \clist_use:cn {g__hook_#1_labels_clist} { ,~ } }
1064         }
1065     }
1066     {
1067         \__hook_log_line:x { Execution~order: }
1068         #2
1069         {
1070             \@spaces Not~set~because~the~hook~ \__hook_if_usable:nTF {#1}
1071             { code~pool~is~empty }
1072             { is~\__hook_if_disabled:nTF {#1} {disabled} {undeclared} }
1073         }
1074     }
1075 }
1076 }

```

To display the code for next invocation only (i.e., from \AddToHookNext we have to remove the first two tokens at the front which are \tl\_gclear:N and the token list to clear.

```

1077 \cs_new:Npn \__hook_log_next_code:n #1

```

```

\__hook_log_next_code:n

```

File h: lthooks.dtx

```
1078 { \exp_args:No \tl_to_str:n { \use_none:nn #1 } }
```

(End definition for `\hook_show:n` and others. These functions are documented on page 193.)

`\__hook_list_rules:nn` This macro takes a  $\langle hook \rangle$  and an  $\langle inline function \rangle$  and loops through each pair of  $\langle labels \rangle$  in the  $\langle hook \rangle$ , and if there is a relation between this pair of  $\langle labels \rangle$ , the  $\langle inline function \rangle$  is executed with  $\#1 = \langle relation \rangle$ ,  $\#2 = \langle label_1 \rangle | \langle label_2 \rangle$ , and  $\#3 = \langle hook \rangle$  (the latter may be the argument  $\#1$  to `\__hook_list_rules:nn`, or ?? if it is a default rule).

```
1079 \cs_new_protected:Npn \__hook_list_rules:nn #1 #2
1080 {
1081   \cs_set_protected:Npn \__hook_tmp:w ##1 ##2 ##3 {#2}
1082   \prop_map_inline:cn { g__hook_#1_code_prop }
1083   {
1084     \prop_map_inline:cn { g__hook_#1_code_prop }
1085     {
1086       \__hook_if_label_case:nnnnn {##1} {####1}
1087       { \prop_map_break: }
1088       { \__hook_list_one_rule:nnn {##1} {####1} }
1089       { \__hook_list_one_rule:nnn {####1} {##1} }
1090       {#1}
1091     }
1092   }
1093 }
```

These two are quite similar to `\__hook_apply_label_pair:nnn` and `\__hook_label_if_exist_apply:nnnF`, respectively, but rather than applying the rule, they pass it to the  $\langle inline function \rangle$ .

```
1094 \cs_new_protected:Npn \__hook_list_one_rule:nnn #1#2#3
1095 {
1096   \__hook_list_if_rule_exists:nnnF {#1} {#2} {#3}
1097   { \__hook_list_if_rule_exists:nnnF {#1} {#2} { ?? } { } }
1098 }
1099 \cs_new_protected:Npn \__hook_list_if_rule_exists:nnnF #1#2#3
1100 {
1101   \if_cs_exist:w g__hook_ #3_rule_ #1 | #2_tl \cs_end:
1102   \exp_args:Nv \__hook_tmp:w
1103   { g__hook_ #3_rule_ #1 | #2_tl } { #1 | #2 } {#3}
1104   \exp_after:wN \use_none:nn
1105   \fi:
1106   \use:n
1107 }
```

(End definition for `\__hook_list_rules:nn`, `\__hook_list_one_rule:nnn`, and `\__hook_list_if_rule_exists:nnnF`.)

`\__hook_debug_print_rules:n` A shorthand for debugging that prints similar to `\prop_show:N`.

```
1108 \cs_new_protected:Npn \__hook_debug_print_rules:n #1
1109 {
1110   \iow_term:n { The~hook~#1~contains~the~rules: }
1111   \cs_set_protected:Npn \__hook_tmp:w ##1
1112   {
1113     \__hook_list_rules:nn {#1}
1114     {
1115       \iow_term:x
1116       {
```



```

1117         > ##1 {####2} ##1 => ##1 {####1}
1118         \str_if_eq:nnT {####3} {??} { ~(default) }
1119     }
1120 }
1121 }
1122 \exp_args:No \__hook_tmp:w { \use:nn { ~ } { ~ } }
1123 }

```

(End definition for `\__hook_debug_print_rules:n`.)

## 4.8 Specifying code for next invocation

`\hook_gput_next_code:nn`

```

1124 \cs_new_protected:Npn \hook_gput_next_code:nn #1
1125 { \__hook_normalize_hook_args:Nn \__hook_gput_next_code:nn {#1} }

```

(End definition for `\hook_gput_next_code:nn`. This function is documented on page 192.)

```

\__hook_gput_next_code:nn
\__hook_gput_next_do:nn
\__hook_gput_next_do:Nnn
1126 \cs_new_protected:Npn \__hook_gput_next_code:nn #1 #2
1127 {
1128     \__hook_if_disabled:nTF {#1}
1129     { \msg_error:nnn { hooks } { hook-disabled } {#1} }
1130     {
1131         \__hook_if_structure_exist:nTF {#1}
1132         { \__hook_gput_next_do:nn {#1} {#2} }
1133         { \__hook_try_declaring_generic_next_hook:nn {#1} {#2} }
1134     }
1135 }
1136 \cs_new_protected:Npn \__hook_gput_next_do:nn #1
1137 {
1138     \exp_args:Nc \__hook_gput_next_do:Nnn
1139     { \__hook_next~#1 } {#1}
1140 }

```

First check if the “next code” token list is empty: if so we need to add a `\tl_gclear:c` to clear it, so the code lasts for one usage only. The token list is cleared early so that nested usages don’t get lost. `\tl_gclear:c` is used instead of `\tl_gclear:N` in case the hook is used in an expansion-only context, so the token list doesn’t expand before `\tl_gclear:N`: that would make an infinite loop. Also in case the main code token list is empty, the hook code has to be updated to add the next execution token list.

```

1141 \cs_new_protected:Npn \__hook_gput_next_do:Nnn #1 #2
1142 {
1143     \tl_if_empty:cT { \__hook~#2 }
1144     { \__hook_update_hook_code:n {#2} }
1145     \tl_if_empty:NT #1
1146     { \__hook_tl_gset:Nn #1 { \__hook_clear_next:n {#2} } }
1147     \__hook_tl_gput_right:Nn #1
1148 }

```

(End definition for `\__hook_gput_next_code:nn`, `\__hook_gput_next_do:nn`, and `\__hook_gput_next_do:Nnn`.)

```

\hook_gclear_next_code:n Discard anything set up for next invocation of the hook.
  \__hook_clear_next:n
1149 \cs_new_protected:Npn \hook_gclear_next_code:n #1
1150 { \__hook_normalize_hook_args:Nn \__hook_clear_next:n {#1} }
1151 \cs_new_protected:Npn \__hook_clear_next:n #1
1152 { \cs_gset_eq:cN { \__hook_next~#1 } \c_empty_tl }

(End definition for \hook_gclear_next_code:n and \__hook_clear_next:n. This function is
documented on page 192.)

```

## 4.9 Using the hook

```

\hook_use:n \hook_use:n as defined here is used in the preamble, where hooks aren't initialized by
\__hook_use_initialized:n default. \__hook_use_initialized:n is also defined, which is the non-\protected ver-
\__hook_use_undefined:w sion for use within the document. Their definition is identical, except for the \__hook_-
\__hook_use_end: preamble_hook:n (which wouldn't hurt in the expandable version, but it would be an
\__hook_preamble_hook:n unnecessary extra expansion).

```

\\_\_hook\_use\_initialized:n holds the expandable definition while in the preamble. \\_\_hook\_preamble\_hook:n initializes the hook in the preamble, and is redefined to \use\_none:n at \begin{document}.

Both versions do the same thing internally: they check that the hook exists as given, and if so they use it as quickly as possible.

At \begin{document}, all hooks are initialized, and any change in them causes an update, so \hook\_use:n can be made expandable. This one is better not protected so that it can expand into nothing if containing no code. Also important in case of generic hooks that we do not generate a \relax as a side effect of checking for a csname. In contrast to the T<sub>E</sub>X low-level \csname ... \endcsname construct \tl\_if\_exist:c is careful to avoid this.

```

1153 <latexrelease> \IncludeInRelease{2021/11/15}{\hook_use:n}
1154 <latexrelease> {Standardise-generic-hook-names}
1155 \cs_new_protected:Npn \hook_use:n #1
1156 {
1157   \tl_if_exist:cT { \__hook~#1 }
1158   {
1159     \__hook_preamble_hook:n {#1}
1160     \cs:w \__hook~#1 \cs_end:
1161   }
1162 }
1163 \cs_new:Npn \__hook_use_initialized:n #1
1164 {
1165   \if_cs_exist:w \__hook~#1 \cs_end:
1166   \cs:w \__hook~#1 \exp_after:wN \cs_end:
1167   \fi:
1168 }
1169 \cs_new_protected:Npn \__hook_preamble_hook:n #1
1170 { \__hook_initialize_hook_code:n {#1} }
1171 <latexrelease> \EndIncludeInRelease
1172 <latexrelease> \IncludeInRelease{2020/10/01}{\hook_use:n}
1173 <latexrelease> {Standardise-generic-hook-names}
1174 <latexrelease> \cs_new_protected:Npn \hook_use:n #1
1175 <latexrelease> {
1176 <latexrelease>   \tl_if_exist:cTF { \__hook~#1 }
1177 <latexrelease>   {

```

```

1178 <latexrelease> \__hook_preamble_hook:n {#1}
1179 <latexrelease> \cs:w __hook~#1 \cs_end:
1180 <latexrelease> }
1181 <latexrelease> { \__hook_use:wn #1 / \s__hook_mark {#1} }
1182 <latexrelease> }
1183 <latexrelease> \cs_new:Npn \__hook_use_initialized:n #1
1184 <latexrelease> {
1185 <latexrelease> \if_cs_exist:w __hook~#1 \cs_end:
1186 <latexrelease> \else:
1187 <latexrelease> \__hook_use_undefined:w
1188 <latexrelease> \fi:
1189 <latexrelease> \cs:w __hook~#1 \__hook_use_end:
1190 <latexrelease> }
1191 <latexrelease> \cs_new:Npn \__hook_use_undefined:w #1 #2 __hook~#3 \__hook_use_end:
1192 <latexrelease> {
1193 <latexrelease> #1 % fi
1194 <latexrelease> \__hook_use:wn #3 / \s__hook_mark {#3}
1195 <latexrelease> }
1196 <latexrelease> \cs_new_protected:Npn \__hook_preamble_hook:n #1
1197 <latexrelease> { \__hook_initialize_hook_code:n {#1} }
1198 <latexrelease> \cs_new_eq:NN \__hook_use_end: \cs_end:
1199 <latexrelease> \EndIncludeInRelease

```

(End definition for \hook\_use:n and others. This function is documented on page 192.)

\\_\_hook\_use:wn \\_\_hook\_use:wn does a quick check to test if the current hook is a file hook: those need a special treatment. If it is not, the hook does not exist. If it is, then \\_\_hook\_try\_file\_hook:n \\_\_hook\_try\_file\_hook:n is called, and checks that the current hook is a file-specific hook using \\_\_hook\_if\_file\_hook:wTF. If it's not, then it's a generic file/ hook and is used if it exist.

If it is a file-specific hook, it passes through the same normalization as during declaration, and then it is used if defined. \\_\_hook\_if\_usable\_use:n checks if the hook exist, and calls \\_\_hook\_preamble\_hook:n if so, then uses the hook.

```

1200 <latexrelease> \IncludeInRelease{2021/11/15}{\__hook_use:wn}
1201 <latexrelease> {Standardise-generic-hook-names}
1202 <latexrelease> \EndIncludeInRelease
1203 <latexrelease> \IncludeInRelease{2020/10/01}{\__hook_use:wn}
1204 <latexrelease> {Standardise-generic-hook-names}
1205 <latexrelease> \cs_new:Npn \__hook_use:wn #1 / #2 \s__hook_mark #3
1206 <latexrelease> {
1207 <latexrelease> \str_if_eq:nnTF {#1} { file }
1208 <latexrelease> { \__hook_try_file_hook:n {#3} }
1209 <latexrelease> { } % Hook doesn't exist
1210 <latexrelease> }
1211 <latexrelease> \cs_new_protected:Npn \__hook_try_file_hook:n #1
1212 <latexrelease> {
1213 <latexrelease> \__hook_if_file_hook:wTF #1 / \s__hook_mark
1214 <latexrelease> {
1215 <latexrelease> \exp_args:Ne \__hook_if_usable_use:n
1216 <latexrelease> { \exp_args:Ne \__hook_file_hook_normalize:n {#1} }
1217 <latexrelease> }
1218 <latexrelease> { \__hook_if_usable_use:n {#1} } % file/ generic hook (e.g. file/before)
1219 <latexrelease> }

```

```

1220 <latexrelease>\cs_new_protected:Npn \__hook_if_usable_use:n #1
1221 <latexrelease> {
1222 <latexrelease> \tl_if_exist:cT { __hook~#1 }
1223 <latexrelease> {
1224 <latexrelease> \__hook_preamble_hook:n {#1}
1225 <latexrelease> \cs:w __hook~#1 \cs_end:
1226 <latexrelease> }
1227 <latexrelease> }
1228 <latexrelease>\EndIncludeInRelease

```

(End definition for \\_\_hook\_use:wn, \\_\_hook\_try\_file\_hook:n, and \\_\_hook\_if\_usable\_use:n.)

**\hook\_use\_once:n** For hooks that can and should be used only once we have a special use command that further inhibits the hook from getting more code added to it. This has the effect that any further code added to the hook is executed immediately rather than stored in the hook.

The code needs some gymnastics to prevent space trimming from the hook name, since \hook\_use:n and \hook\_use\_once:n are documented to not trim spaces.

```

1229 \cs_new_protected:Npn \hook_use_once:n #1
1230 {
1231 \__hook_if_execute_immediately:nF {#1}
1232 { \__hook_normalize_hook_args:Nn \__hook_use_once:n { \use:n {#1} } }
1233 }
1234 \cs_new_protected:Npn \__hook_use_once:n #1
1235 {
1236 \__hook_preamble_hook:n {#1}
1237 \__hook_use_once_set:n {#1}
1238 \__hook_use_initialized:n {#1}
1239 \__hook_use_once_clear:n {#1}
1240 }

```

\\_\_hook\_use\_once\_set:n is used before the actual hook code is executed so that any usage of \AddToHook inside the hook causes the code to execute immediately. Setting \g\_\_hook\_<hook>\_reversed\_tl to I prevents further code from being added to the hook. \\_\_hook\_use\_once\_clear:n then clears the hook so that any further call to \hook\_use:n or \hook\_use\_once:n will expand to nothing.

```

1241 \cs_new_protected:Npn \__hook_use_once_set:n #1
1242 { \__hook_tl_gset:cn { g__hook_#1_reversed_tl } { I } }
1243 \cs_new_protected:Npn \__hook_use_once_clear:n #1
1244 {
1245 \__hook_tl_gclear:c { __hook~#1 }
1246 \__hook_tl_gclear:c { __hook_next~#1 }
1247 \__hook_tl_gclear:c { __hook_toplevel~#1 }
1248 \prop_gclear_new:c { g__hook_#1_code_prop }
1249 }

```

(End definition for \hook\_use\_once:n and others. This function is documented on page 192.)

**\\_\_hook\_if\_execute\_immediately\_p:n** To check whether the code being added should be executed immediately (that is, if the hook is a one-time hook), we check if it's usable (it can't be one-time if it was not already usable), then we check that \g\_\_hook\_<hook>\_reversed\_tl is I. The gymnastics around \if:w is there to allow the reversed token list to be empty.

**\\_\_hook\_if\_execute\_immediately:nTF**

```

1250 \prg_new_conditional:Npnn \__hook_if_execute_immediately:n #1 { T, F, TF }

```

```

1251 {
1252   \__hook_if_usable:nTF {#1}
1253   {
1254     \exp_after:wN \__hook_clean_to_scan:w
1255     \if:w I \cs:w g__hook_#1_reversed_tl \cs_end:
1256       \s_hook_mark \prg_return_true:
1257     \else:
1258       \s_hook_mark \prg_return_false:
1259     \fi:
1260   }
1261   { \prg_return_false: }
1262 }

```

(End definition for \\_\_hook\_if\_execute\_immediately:nTF.)

## 4.10 Querying a hook

Simpler data types, like token lists, have three possible states; they can exist and be empty, exist and be non-empty, and they may not exist, in which case emptiness doesn’t apply (though \tl\_if\_empty:N returns false in this case).

Hooks are a bit more complicated: they have several other states as discussed in 4.4.2. A hook may exist or not, and either way it may or may not be empty (even a hook that doesn’t exist may be non-empty) or may be disabled.

A hook is said to be empty when no code was added to it, either to its permanent code pool, or to its “next” token list. The hook doesn’t need to be declared to have code added to its code pool (it may happen that a package *A* defines a hook *foo*, but it’s loaded after package *B*, which adds some code to that hook. In this case it is important that the code added by package *B* is remembered until package *A* is loaded).

All other states can only be queried with internal tests as the different states are irrelevant for package code.

**\hook\_if\_empty\_p:n** Test if a hook is empty (that is, no code was added to that hook). A  $\langle hook \rangle$  being empty means that all three of its  $\langle g\_hook\_hook \rangle\_code\_prop$ , its  $\langle \_hook\_toplevel\_hook \rangle$  and its  $\langle \_hook\_next\_hook \rangle$  are empty.

**\hook\_if\_empty:nTF**

```

1263 \prg_new_conditional:Npnn \hook_if_empty:n #1 { p , T , F , TF }
1264 {
1265   \__hook_if_structure_exist:nTF {#1}
1266   {
1267     \bool_lazy_and:nnTF
1268     { \prop_if_empty_p:c { g__hook_#1_code_prop } }
1269     {
1270       \bool_lazy_and_p:nn
1271       { \tl_if_empty_p:c { __hook_toplevel~#1 } }
1272       { \tl_if_empty_p:c { __hook_next~#1 } }
1273     }
1274     { \prg_return_true: }
1275     { \prg_return_false: }
1276   }
1277   { \prg_return_true: }
1278 }

```

(End definition for \hook\_if\_empty:nTF. This function is documented on page 193.)

`\__hook_if_usable_p:n` A hook is usable if the token list that stores the sorted code for that hook, `\__hook <hook>`, exists. The property list `\g__hook_<hook>_code_prop` cannot be used here because often it is necessary to add code to a hook without knowing if such hook was already declared, or even if it will ever be (for example, in case the package that defines it isn't loaded).

```

1279 \prg_new_conditional:Npnn \__hook_if_usable:n #1 { p , T , F , TF }
1280 {
1281   \tl_if_exist:cTF { __hook~#1 }
1282   { \prg_return_true: }
1283   { \prg_return_false: }
1284 }

```

(End definition for `\__hook_if_usable:nTF`.)

`\__hook_if_structure_exist_p:n` An internal check if the hook has already its basic internal structure set up with `\__hook_init_structure:n`. This means that the hook was already used somehow (a code chunk or rule was added to it), but it still wasn't declared with `\hook_new:n`.

```

1285 \prg_new_conditional:Npnn \__hook_if_structure_exist:n #1 { p , T , F , TF }
1286 {
1287   \prop_if_exist:cTF { g__hook_#1_code_prop }
1288   { \prg_return_true: }
1289   { \prg_return_false: }
1290 }

```

(End definition for `\__hook_if_structure_exist:nTF`.)

`\__hook_if_declared_p:n` Internal test to check if the hook was officially declared with `\hook_new:n` or a variant.

```

\__hook_if_declared:nTF
1291 \prg_new_conditional:Npnn \__hook_if_declared:n #1 { p , T , F , TF }
1292 {
1293   \tl_if_exist:cTF { g__hook_#1_declared_tl }
1294   { \prg_return_true: }
1295   { \prg_return_false: }
1296 }

```

(End definition for `\__hook_if_declared:nTF`.)

`\__hook_if_reversed_p:n` An internal conditional that checks if a hook is reversed.

```

\__hook_if_reversed:nTF
1297 \prg_new_conditional:Npnn \__hook_if_reversed:n #1 { p , T , F , TF }
1298 {
1299   \exp_after:wN \__hook_clean_to_scan:w
1300   \if:w - \cs:w g__hook_#1_reversed_tl \cs_end:
1301     \s__hook_mark \prg_return_true:
1302   \else:
1303     \s__hook_mark \prg_return_false:
1304   \fi:
1305 }

```

(End definition for `\__hook_if_reversed:nTF`.)

`\__hook_if_generic_p:n` An internal conditional that checks if a name belongs to a generic hook. The deprecated version needs to check if #3 is empty to avoid returning true on file/before, for example.

```

\__hook_if_generic:nTF
\__hook_if_deprecated_generic_p:n
\__hook_if_deprecated_generic:nTF
1306 \prg_new_conditional:Npnn \__hook_if_generic:n #1 { T , TF }
1307 { \__hook_if_generic:w #1 / / / \s__hook_mark }
1308 \cs_new:Npn \__hook_if_generic:w #1 / #2 / #3 / #4 \s__hook_mark

```

```

1309 {
1310   \cs_if_exist:cTF { c__hook_generic_#1/./#3_tl }
1311   { \prg_return_true: }
1312   { \prg_return_false: }
1313 }
1314 \prg_new_conditional:Npnn \__hook_if_deprecated_generic:n #1 { T, TF }
1315 { \__hook_if_deprecated_generic:w #1 / / / \s__hook_mark }
1316 \cs_new:Npn \__hook_if_deprecated_generic:w #1 / #2 / #3 / #4 \s__hook_mark
1317 {
1318   \cs_if_exist:cTF { c__hook_deprecated_#1/./#2_tl }
1319   {
1320     \tl_if_empty:nTF {#3}
1321     { \prg_return_false: }
1322     { \prg_return_true: }
1323   }
1324   { \prg_return_false: }
1325 }

```

(End definition for \\_\_hook\_if\_generic:nTF and \\_\_hook\_if\_deprecated\_generic:nTF.)

\\_\_hook\_if\_generic\_reversed\_p:n An internal conditional that checks if a name belongs to a generic reversed hook.

```

\__hook_if_generic_reversed:nTF 1326 \prg_new_conditional:Npnn \__hook_if_generic_reversed:n #1 { T }
1327 { \__hook_if_generic_reversed:w #1 / / / \scan_stop: }
1328 \cs_new:Npn \__hook_if_generic_reversed:w #1 / #2 / #3 / #4 \scan_stop:
1329 {
1330   \if_charcode:w - \cs:w c__hook_generic_#1/./#3_tl \cs_end:
1331   \prg_return_true:
1332   \else:
1333   \prg_return_false:
1334   \fi:
1335 }

```

(End definition for \\_\_hook\_if\_generic\_reversed:nTF.)

## 4.11 Messages

Hook errors are LaTeX kernel errors:

```

1336 \prop_gput:Nnn \g_msg_module_type_prop { hooks } { LaTeX }
And so are kernel errors (this should move elsewhere eventually).
1337 \prop_gput:Nnn \g_msg_module_type_prop { latex2e } { LaTeX }
1338 \prop_gput:Nnn \g_msg_module_name_prop { latex2e } { kernel }
1339 \msg_new:nnnn { hooks } { labels-incompatible }
1340 {
1341   Labels~'~#1'~and~'~#2'~are~incompatible
1342   \str_if_eq:nnF {#3} {??} { ~in-hook~'~#3' } .~
1343   \int_compare:nNnTF {#4} = { 1 }
1344   { The~ code~ for~ both~ labels~ will~ be~ dropped. }
1345   { You~ may~ see~ errors~ later. }
1346 }
1347 { LaTeX~found~two~incompatible~labels~in~the~same~hook.~
1348   This~indicates~an~incompatibility~between~packages. }

```

```

1349 \msg_new:nnnn { hooks } { exists }
1350 { Hook~'#1'~ has~ already~ been~ declared. }
1351 { There~ already~ exists~ a~ hook~ declaration~ with~ this~
1352   name.\\
1353   Please~ use~ a~ different~ name~ for~ your~ hook.}

1354 \msg_new:nnnn { hooks } { hook-disabled }
1355 { Cannot~add~code~to~disabled~hook~'#1'. }
1356 {
1357   The~hook~'#1'~you~tried~to~add~code~to~was~previously~disabled~
1358   with~\iow_char:N\\hook_disable_generic:n-or~\iow_char:N\\DisableGenericHook,~so~
1359   it~cannot~have~code~added~to~it.
1360 }

1361 \msg_new:nnn { hooks } { empty-label }
1362 {
1363   Empty~code~label~\msg_line_context:~
1364   Using~'\_hook_currname_or_default:'~instead.
1365 }

1366 \msg_new:nnn { hooks } { no-default-label }
1367 {
1368   Missing~(empty)~default~label~\msg_line_context:. \\
1369   This~command~was~ignored.
1370 }

1371 \msg_new:nnnn { hooks } { unknown-rule }
1372 {
1373   Unknown~ relationship~ '#3'~
1374   between~ labels~ '#2'~ and~ '#4'~
1375   \str_if_eq:nnF {#1} {??} { ~in~hook~'#1' }. ~
1376   Perhaps~ a~ misspelling?
1377 }
1378 {
1379   The~ relation~ used~ not~ known~ to~ the~ system.~ Allowed~ values~ are~
1380   'before'~ or~ '<',~
1381   'after'~ or~ '>',~
1382   'incompatible-warning',~
1383   'incompatible-error',~
1384   'voids'~ or~
1385   'unrelated'.
1386 }

1387 \msg_new:nnnn { hooks } { rule-too-late }
1388 {
1389   Sorting~rule~for~'#1'~hook~applied~too~late.\\
1390   Try~setting~this~rule~earlier.
1391 }
1392 {
1393   You~tried~to~set~the~ordering~of~hook~'#1'~using\\
1394   \ \ \iow_char:N\\DeclareHookRule{#1}{#2}{#3}{#4}\\
1395   but~hook~'#1'~was~already~used~as~a~one-time~hook,~
1396   thus~sorting~is\\
1397   no~longer~possible.~Declare~the~rule~
1398   before~the~hook~is~used.
1399 }

1400 \msg_new:nnnn { hooks } { misused-top-level }

```



```

1401 {
1402   Illegal-use-of~\iow_char:N \AddToHook{#1}[top-level]{...}.\
1403   'top-level'~is~reserved~for~the~user's~document.
1404 }
1405 {
1406   The~'top-level'~label~is~meant~for~user~code~only,~and~should~only~
1407   be~used~(sparingly)~in~the~main~document.~Use~the~default~label~
1408   '\_hook_currname_or_default:'~for~this~\@cls@pkg,~or~another~
1409   suitable~label.
1410 }
1411 \msg_new:nnn { hooks } { set-top-level }
1412 {
1413   You~cannot~change~the~default~label~#1~'top-level'.~Illegal \
1414   \use:nn { ~ } { ~ } \iow_char:N \#2{#3} \
1415   \msg_line_context:.
1416 }
1417 \msg_new:nnn { hooks } { extra-pop-label }
1418 {
1419   Extra~\iow_char:N \PopDefaultHookLabel. \
1420   This~command~will~be~ignored.
1421 }
1422 \msg_new:nnn { hooks } { missing-pop-label }
1423 {
1424   Missing~\iow_char:N \PopDefaultHookLabel. \
1425   The~label~'#1'~was~pushed~but~never~popped.~Something~is~wrong.
1426 }
1427 \msg_new:nnn { latex2e } { should-not-happen }
1428 {
1429   This~should~not~happen.~#1 \
1430   Please~report~at~https://github.com/latex3/latex2e.
1431 }
1432 \msg_new:nnn { hooks } { activate-disabled }
1433 {
1434   Cannot~ activate~ hook~ '#1'~ because~ it~ is~ disabled!
1435 }
1436 \msg_new:nnn { hooks } { cannot-remove }
1437 {
1438   Cannot~remove~chunk~'#2'~from~hook~'#1'~because~
1439   \_hook_if_structure_exist:nTF {#1}
1440   { it~does~not~exist~in~that~hook. }
1441   { the~hook~does~not~exist. }
1442 }
1443 \msg_new:nnn { hooks } { generic-deprecated }
1444 {
1445   Generic~hook~'#1/#2/#3'~is~deprecated. \
1446   Use~hook~'#1/#3/#2'~instead.
1447 }

```

## 4.12 L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> package interface commands

`\NewHook`     Declaring new hooks ...  
`\NewReversedHook`  
`\NewMirroredHookPair`

File h: lthooks.dtx

```

1448 \NewDocumentCommand \NewHook { m }{ \hook_new:n {#1} }
1449 \NewDocumentCommand \NewReversedHook { m }{ \hook_new_reversed:n {#1} }
1450 \NewDocumentCommand \NewMirroredHookPair { mm }{ \hook_new_pair:nn {#1}{#2} }

```

(End definition for `\NewHook`, `\NewReversedHook`, and `\NewMirroredHookPair`. These functions are documented on page 181.)

```

1451 \<latexrelease>\IncludeInRelease{2021/06/01}%
1452 \<latexrelease> { \hook_activate_generic:n }{Providing-hooks}

```

**\ActivateGenericHook** Providing new hooks ...

```

1453 \NewDocumentCommand \ActivateGenericHook { m }{ \hook_activate_generic:n {#1} }

```

(End definition for `\ActivateGenericHook`. This function is documented on page 182.)

**\DisableGenericHook** Disabling a generic hook.

```

1454 \NewDocumentCommand \DisableGenericHook { m }{ \hook_disable_generic:n {#1} }

```

(End definition for `\DisableGenericHook`. This function is documented on page 182.)

```

1455 \<latexrelease>\EndIncludeInRelease
1456 \<latexrelease>\IncludeInRelease{2020/10/01}
1457 \<latexrelease> { \hook_activate_generic:n }{Providing-hooks}
1458 \<latexrelease>
1459 \<latexrelease>\def \ActivateGenericHook#1{
1460 \<latexrelease>
1461 \<latexrelease>\EndIncludeInRelease

```

**\AddToHook**

```

1462 \NewDocumentCommand \AddToHook { m o +m }
1463 { \hook_gput_code:nnn {#1} {#2} {#3} }

```

(End definition for `\AddToHook`. This function is documented on page 183.)

**\AddToHookNext**

```

1464 \NewDocumentCommand \AddToHookNext { m +m }
1465 { \hook_gput_next_code:nn {#1} {#2} }

```

(End definition for `\AddToHookNext`. This function is documented on page 185.)

**\ClearHookNext**

```

1466 \NewDocumentCommand \ClearHookNext { m }
1467 { \hook_gclear_next_code:n {#1} }

```

(End definition for `\ClearHookNext`. This function is documented on page 185.)

**\RemoveFromHook**

```

1468 \NewDocumentCommand \RemoveFromHook { m o }
1469 { \hook_gremove_code:nn {#1} {#2} }

```

(End definition for `\RemoveFromHook`. This function is documented on page 184.)

`\SetDefaultHookLabel` Now define a wrapper that replaces the top of the stack with the argument, and updates  
`\PushDefaultHookLabel` `\g__hook_hook_curr_name_tl` accordingly.  
`\PopDefaultHookLabel`

```

1470 \NewDocumentCommand \SetDefaultHookLabel { m }
1471 { \__hook_set_default_hook_label:n {#1} }
1472 %
1473 % The label is only automatically updated with \cs{@onefilewithoptions}
1474 % (\cs{usepackage} and \cs{documentclass}), but some packages, like
1475 % Ti\emph{k}Z, define package-like interfaces, like
1476 % \cs{usetikzlibrary} that are wrappers around \cs{input}, so they
1477 % inherit the default label currently in force (usually |top-level|,
1478 % but it may change if loaded in another package). To provide a
1479 % package-like behavior also for hooks in these files, we provide
1480 % high-level access to the default label stack.
1481 % \begin{macrocode}
1482 \NewDocumentCommand \PushDefaultHookLabel { m }
1483 { \__hook_curr_name_push:n {#1} }
1484 \NewDocumentCommand \PopDefaultHookLabel { }
1485 { \__hook_curr_name_pop: }

```

The current label stack holds the labels for all files but the current one (more or less like `\@currnamestack`), and the current label token list, `\g__hook_hook_curr_name_tl`, holds the label for the current file. However `\@pushfilename` happens before `\@currname` is set, so we need to look ahead to get the `\@currname` for the label. `expl3` also requires the current file in `\@pushfilename`, so here we abuse `\@expl@push@filename@aux@@` to do `\__hook_curr_name_push:n`.

```

1486 \cs_gset_protected:Npn \@expl@push@filename@aux@@ #1#2#3
1487 {
1488   \__hook_curr_name_push:n {#3}
1489   \str_gset:Nx \g_file_curr_name_str {#3}
1490   #1 #2 {#3}
1491 }

```

*(End definition for `\SetDefaultHookLabel`, `\PushDefaultHookLabel`, and `\PopDefaultHookLabel`. These functions are documented on page 187.)*

`\UseHook` Avoid the overhead of `xparse` and its protection that we don't want here (since the hook  
`\UseOneTimeHook` should vanish without trace if empty)!

```

1492 \cs_new:Npn \UseHook { \hook_use:n }
1493 \cs_new:Npn \UseOneTimeHook { \hook_use_once:n }

```

*(End definition for `\UseHook` and `\UseOneTimeHook`. These functions are documented on page 182.)*

`\ShowHook`  
`\LogHook`

```

1494 \cs_new_protected:Npn \ShowHook { \hook_show:n }
1495 \cs_new_protected:Npn \LogHook { \hook_log:n }

```

*(End definition for `\ShowHook` and `\LogHook`. These functions are documented on page 190.)*

`\DebugHooksOn`  
`\DebugHooksOff`

```

1496 \cs_new_protected:Npn \DebugHooksOn { \hook_debug_on: }
1497 \cs_new_protected:Npn \DebugHooksOff { \hook_debug_off: }

```

*(End definition for `\DebugHooksOn` and `\DebugHooksOff`. These functions are documented on page 191.)*

## `\DeclareHookRule`

```
1498 \NewDocumentCommand \DeclareHookRule { m m m m }
1499 { \hook_gset_rule:nnnn {#1}{#2}{#3}{#4} }
```

(End definition for `\DeclareHookRule`. This function is documented on page 188.)

## `\DeclareDefaultHookRule`

This declaration is only supported before `\begin{document}`.

```
1500 \NewDocumentCommand \DeclareDefaultHookRule { m m m }
1501 { \hook_gset_rule:nnnn {??}{#1}{#2}{#3} }
1502 \@onlypreamble\DeclareDefaultHookRule
```

(End definition for `\DeclareDefaultHookRule`. This function is documented on page 189.)

## `\ClearHookRule`

A special setup rule that removes an existing relation. Basically `@@_rule_gclear:nnn` plus fixing the property list for debugging.

*FMi: Needs perhaps an L3 interface, or maybe it should get dropped?*

```
1503 \NewDocumentCommand \ClearHookRule { m m m }
1504 { \hook_gset_rule:nnnn {#1}{#2}{unrelated}{#3} }
```

(End definition for `\ClearHookRule`. This function is documented on page 189.)

## `\IfHookEmptyTF`

Here we avoid the overhead of `xparse`, since `\IfHookEmptyTF` is used in `\end` (that is, every L<sup>A</sup>T<sub>E</sub>X environment). As a further optimization, use `\let` rather than `\def` to avoid one expansion step.

```
1505 \cs_new_eq:NN \IfHookEmptyTF \hook_if_empty:nTF
```

(End definition for `\IfHookEmptyTF`. This function is documented on page 189.)

## `\IfHookExistsTF`

Marked for removal and no longer documented in the doc section!

*PhO: \IfHookExistsTF is used in `jlreq.cls`, `pxatbegshi.sty`, `pxeveryssel.sty`, `pxeveryshi.sty`, so the public name may be an alias of the internal conditional for a while. Regardless, those packages' use for `\IfHookExistsTF` is not really correct and can be changed.*

```
1506 \cs_new_eq:NN \IfHookExistsTF \__hook_if_usable:nTF
```

(End definition for `\IfHookExistsTF`.)

## 4.13 Deprecated that needs cleanup at some point

### `\hook_disable:n`

Deprecated.

### `\hook_provide:n`

```
1507 \cs_new_protected:Npn \hook_disable:n
```

### `\hook_provide_reversed:n`

```
1508 {
```

### `\hook_provide_pair:nn`

```
1509 \__hook_deprecated_warn:nn
```

### `\__hook_activate_generic_reversed:n`

```
1510 { hook_disable:n }
```

### `\__hook_activate_generic_pair:nn`

```
1511 { hook_disable_generic:n }
```

```
1512 \hook_disable_generic:n
```

```
1513 }
```

```
1514 \cs_new_protected:Npn \hook_provide:n
```

```
1515 {
```

```
1516 \__hook_deprecated_warn:nn
```

```
1517 { hook_provide:n }
```

```
1518 { hook_activate_generic:n }
```

```
1519 \hook_activate_generic:n
```

```
1520 }
```

```

1521 \cs_new_protected:Npn \hook_provide_reversed:n
1522 {
1523   \__hook_deprecated_warn:nn
1524   { hook_provide_reversed:n }
1525   { hook_activate_generic:n }
1526   \__hook_activate_generic_reversed:n
1527 }
1528 \cs_new_protected:Npn \hook_provide_pair:nn
1529 {
1530   \__hook_deprecated_warn:nn
1531   { hook_provide_pair:nn }
1532   { hook_activate_generic:n }
1533   \__hook_activate_generic_pair:nn
1534 }
1535 \cs_new_protected:Npn \__hook_activate_generic_reversed:n #1
1536 { \__hook_normalize_hook_args:Nn \__hook_activate_generic:nn {#1} { - } }
1537 \cs_new_protected:Npn \__hook_activate_generic_pair:nn #1#2
1538 { \hook_activate_generic:n {#1} \__hook_activate_generic_reversed:n {#2} }

```

*(End definition for \hook\_disable:n and others.)*

```

\DisableHook   Deprecated.
\ProvideHook   \cs_new_protected:Npn \DisableHook
\ProvideReversedHook 1539 {
\ProvideMirroredHookPair 1540 {
1541   \__hook_deprecated_warn:nn
1542   { DisableHook }
1543   { DisableGenericHook }
1544   \hook_disable_generic:n
1545 }
1546 \cs_new_protected:Npn \ProvideHook
1547 {
1548   \__hook_deprecated_warn:nn
1549   { ProvideHook }
1550   { ActivateGenericHook }
1551   \hook_activate_generic:n
1552 }
1553 \cs_new_protected:Npn \ProvideReversedHook
1554 {
1555   \__hook_deprecated_warn:nn
1556   { ProvideReversedHook }
1557   { ActivateGenericHook }
1558   \__hook_activate_generic_reversed:n
1559 }
1560 \cs_new_protected:Npn \ProvideMirroredHookPair
1561 {
1562   \__hook_deprecated_warn:nn
1563   { ProvideMirroredHookPair }
1564   { ActivateGenericHook }
1565   \__hook_activate_generic_pair:nn
1566 }

```

*(End definition for \DisableHook and others.)*

\\_\_hook\_deprecated\_warn:nn Warns about a deprecation, telling what should be used instead.

```

1567 \cs_new_protected:Npn \__hook_deprecated_warn:nn #1 #2
1568 { \msg_warning:nnnn { hooks } { deprecated } {#1} {#2} }
1569 \msg_new:nnn { hooks } { deprecated }
1570 {
1571   Command~\iow_char:N\\#1~is~deprecated~and~will~be~removed~in~a~
1572   future~release. \\ \\
1573   Use~\iow_char:N\\#2~instead.
1574 }

```

(End definition for \\_\_hook\_deprecated\_warn:nn.)

## 4.14 Internal commands needed elsewhere

Here we set up a few horrible (but consistent) L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> names to allow for internal commands to be used outside this module. We have to unset the @@ since we want double “at” sign in place of double underscores.

```

1575 <@@=>

\@expl@@@initialize@all@@
\@expl@@@hook@curr@name@pop@@
1576 \cs_new_eq:NN \@expl@@@initialize@all@@
1577 \__hook_initialize_all:
1578 \cs_new_eq:NN \@expl@@@hook@curr@name@pop@@
1579 \__hook_curr_name_pop:

```

(End definition for \@expl@@@initialize@all@@ and \@expl@@@hook@curr@name@pop@@.)

Rolling back here doesn’t undefine the interface commands as they may be used in packages without rollback functionality. So we just make them do nothing which may or may not work depending on the code usage.

```

1580 %
1581 <latexrelease> \IncludeInRelease{0000/00/00}%
1582 <latexrelease> {lthooks}{The~hook~management}%
1583 <latexrelease>
1584 <latexrelease> \def \NewHook#1{}
1585 <latexrelease> \def \NewReversedHook#1{}
1586 <latexrelease> \def \NewMirroredHookPair#1#2{}
1587 <latexrelease>
1588 <latexrelease> \def \DisableGenericHook #1{}
1589 <latexrelease>
1590 <latexrelease> \long\def\AddToHookNext#1#2{}
1591 <latexrelease>
1592 <latexrelease> \def\AddToHook#1{\@gobble@AddToHook@args}
1593 <latexrelease> \providecommand\@gobble@AddToHook@args[2] [] {}
1594 <latexrelease>
1595 <latexrelease> \def\RemoveFromHook#1{\@gobble@RemoveFromHook@arg}
1596 <latexrelease> \providecommand\@gobble@RemoveFromHook@arg[1] [] {}
1597 <latexrelease>
1598 <latexrelease> \def \UseHook #1{}
1599 <latexrelease> \def \UseOneTimeHook #1{}
1600 <latexrelease> \def \ShowHook #1{}
1601 <latexrelease> \let \DebugHooksOn \@empty
1602 <latexrelease> \let \DebugHooksOff \@empty
1603 <latexrelease>
1604 <latexrelease> \def \DeclareHookRule #1#2#3#4{}

```

```

1605 <latexrelease>\def \DeclareDefaultHookRule #1#2#3{}
1606 <latexrelease>\def \ClearHookRule #1#2#3{}

```

If the hook management is not provided we make the test for existence false and the test for empty true in the hope that this is most of the time reasonable. If not a package would need to guard against running in an old kernel.

```

1607 <latexrelease>\long\def \IfHookExistsTF #1#2#3{#3}
1608 <latexrelease>\long\def \IfHookEmptyTF #1#2#3{#2}
1609 <latexrelease>
1610 <latexrelease>\EndModuleRelease
1611 \ExplSyntaxOff
1612 </2ekernel | latexrelease>

```

# File i

## ltxcmdhooks.dtx

### 1 Introduction

This file implements generic hooks for (arbitrary) commands. In theory every command `\<name>` offers now two associated hooks to which code can be added using `\AddToHook` or `\AddToHookNext`.<sup>11</sup> These are

**cmd/<name>/before** This hook is executed at the very start of the command execution after its arguments (if any) are parsed. The hook `<code>` is wrapped in the command inside a call to `\UseHook{cmd/<name>/before}`, so the arguments passed to the command are *not* available in the hook `<code>`.

**cmd/<name>/after** This hook is similar to `cmd/<name>/before`, but it is executed at the very end of the command body. This hook is implemented as a reversed hook.

The hooks are not physically present before `\begin{document}` (i.e., using a command in the preamble will never execute them) and if nobody has declared any code for them, then they are not added to the command code ever. For example, if we have the following definition

```
\newcommand\foo[2]{Code #1 for #2!}
```

then executing `\foo{A}{B}` will simply run `Code_A_for_B!` as it was always the case. However, if somebody, somewhere (e.g., in a package) adds

```
\AddToHook{cmd/foo/before}{<before code>}
```

then, after `\begin{document}` the definition of `\foo` will be:

```
\renewcommand\foo[2]{\UseHook{cmd/foo/before}Code #1 for #2!}
```

and similarly `\AddToHook{cmd/foo/after}{<after code>}` alters the definition to

```
\renewcommand\foo[2]{Code #1 for #2!\UseHook{cmd/foo/after}}
```

In other words, the mechanism is similar to what `etoolbox` offers with `\pretocmd` and `\apptocmd` with the important differences

- that code can be prepended or appended (i.e., added to the hooks) even if the command itself is not defined, because the defining package has not yet been loaded
- and that by using the hook management interface it is now possible to define how the code chunks added in these places are ordered, if different packages want to add code at these points.

### 2 Restrictions and Operational details

Adding arbitrary material to commands is tricky because most of the time we do not know what the macro expects as arguments when expanding and `TEX` doesn't have a reliable way to see that, so some guesswork has to be employed.

---

<sup>11</sup>In practice this is not supported for all types of commands, see section 2.2 for the restrictions that apply and what happens if one tries to use this with commands for which this is not supported.



## 2.1 Patching

The code here tries to find out if a command was defined with `\newcommand` or `\DeclareRobustCommand` or `\NewDocumentCommand`, and if so it *assumes* that the argument specification of the command is as expected (which is not fail-proof, if someone redefines the internals of these commands in devious ways, but is a reasonable assumption).

If the command is one of the defined types, the code here does a sandboxed expansion of the command such that it can be redefined again exactly as before, but with the hook code added.

If however the command is not a known type (it was defined with `\def`, for example), then the code uses an approach similar to `etoolbox`'s `\patchcmd` to retokenize the command with the hook code in place. This procedure, however, is more likely to fail if the catcode settings are not the same as the ones at the time of command's definition, so not always adding a hook to a command will work.

### 2.1.1 Timing

When `\AddToHook` (or its `expl3` equivalent) is called with a generic `cmd` hook, say, `cmd/foo/before`, for the first time (that is, no code was added to that same hook before), in the preamble of a document, it will store a patch instruction for that command until `\begin{document}`, and only then all the commands which had hooks added will be patched in one go. That means that no command in the preamble will have hooks patched into them.

At `\begin{document}` all the delayed patches will be executed, and if the command doesn't exist the code is still added to the hook, but it will not be executed. After `\begin{document}`, when `\AddToHook` is called with a generic `cmd` hook the first time, the command will be immediately patched to include the hook, and if it doesn't exist or if it can't be patched for any reason, an error is thrown; if `\AddToHook` was already used in the preamble no new patching is attempted.

This has the consequence that a command defined or redefined after `\begin{document}` only uses generic `cmd` hook code if `\AddToHook` is called for the first time after the definition is made, or if the command explicitly uses the generic hook in its definition by declaring it with `\NewHookPair` adding `\UseHook` as part of the code.<sup>12</sup>

## 2.2 Commands that look ahead

Some commands are defined in different “steps” and they look ahead in the input stream to find more arguments. If you try to add some code to the `cmd/<name>/after` hook of such command, it will not work, and it is not possible to detect that programmatically, so the user has to know (or find out) which commands can or cannot have hooks attached to them.

One good example is the `\section` command. You can add something to the `cmd/section/before` hook, but if you try to add something to the `cmd/section/after` hook, `\section` will no longer work. That happens because the `\section` macro takes no argument, but instead calls a few internal `LATEX` macros to look for the optional and mandatory arguments. By adding code to the `cmd/section/after` hook, you get in the way of that scanning.

---

<sup>12</sup>We might change this behavior in the main document slightly after gaining some usage experience.

### 3 Package Author Interface

The `cmd` hooks are, by default, available for all commands that can be patched to add the hooks. For some commands, however, the very beginning or the very end of the code is not the best place to put the hooks, for example, if the command looks ahead for arguments (see section 2.2).

If you are a package author and you want to add the hooks to your own commands in the proper position you can define the command and manually add the `\UseHook` calls inside the command in the proper positions, and manually define the hooks with `\NewHook` or `\NewReversedHook`. When the hooks are explicitly defined, patching is not attempted so you can make sure your command works properly. For example, an (admittedly not really useful) command that typesets its contents in a framed box with width optionally given in parentheses:

```
\newcommand\fancybox{\ifnextchar({\@fancybox}{\@fancybox(5cm)}}
\def\@fancybox(#1)#2{\fbox{\parbox{#1}{#2}}}
```

If you try that definition, then add some code after it with

```
\AddToHook{cmd/fancybox/after}{<code>}
```

and then use the `\fancybox` command you will see that it will be completely broken, because the hook will get executed in the middle of parsing for optional `(...)` argument.

If, on the other hand, you want to add hooks to your command you can do something like:

```
\newcommand\fancybox{\ifnextchar({\@fancybox}{\@fancybox(5cm)}}
\def\@fancybox(#1)#2{\fbox{%
    \UseHook{cmd/fancybox/before}%
    \parbox{#1}{#2}%
    \UseHook{cmd/fancybox/after}}}
\NewHook{cmd/fancybox/before}
\NewReversedHook{cmd/fancybox/after}
```

then the hooks will be executed where they should and no patching will be attempted. It is important that the hooks are declared with `\NewHook` or `\NewReversedHook`, otherwise the command hook code will try to patch the command. Note also that the call to `\UseHook{cmd/fancybox/before}` does not need to be in the definition of `\fancybox`, but anywhere it makes sense to insert it (in this case in the internal `\@fancybox`).

Alternatively, if for whatever reason your command does not support the generic hooks provided here, you can disable a hook with `\DisableHook`<sup>13</sup>, so that when someone tries to add code to it they will get an error. Or if you don't want the error, you can simply declare the hook with `\NewHook` and never use it.

The above approach is useful for really complex commands where for one or the other reason the hooks can't be placed at the very beginning and end of the command body and some hand-crafting is needed. However, in the example above the real (and in fact only) issue is the cascading argument parsing in the style developed long ago in L<sup>A</sup>T<sub>E</sub>X 2.09. Thus, a much simpler solution for this case is to replace it with the modern `\NewDocumentCommand` syntax and define the command as follows:

```
\DeclareDocumentCommand\fancybox{D()}{5cm}m}{\fbox{\parbox{#1}{#2}}}
```

If you do that then both hooks automatically work and are patched into the right places.

---

<sup>13</sup>Please use `\DisableHook` if at all, only on hooks that you “own”, i.e., for commands that your package or class defines and not second guess whether or not hooks of other packages should get disabled!

## 4 The Implementation

### 4.1 Execution plan

To add **before** and **after** hooks to a command we will need to peek into the definition of a command, which is always a tricky thing to do. Some cases are easy because we know how the command was defined, so we can assume how its *⟨parameter text⟩* looks like (for example a command defined with `\newcommand` may have an optional argument followed by a run of mandatory arguments), so we can just expand that command and make it grab `#1`, `#2`, etc. as arguments and define it all back with the hooks added.

Life's usually not that easy, so with some commands we can't do that (a `#1` might as well be `#12112` instead of the expected `#6112`, for example) so we need to resort to "patching" the command: read its `\meaning`, and tokenize it again with `\scantokens` and hope for the best.

So the overall plan is:

1. Check if a command is of a known type (that is, defined with `\newcommand`<sup>14</sup>, `\DeclareRobustCommand`, or `\New(Expandable)DocumentCommand`), and if is, take appropriate action.
2. If the command is not a known type, we'll check if the command can be patched. Two things will prevent a command from being patched: if it was defined in a nonstandard catcode setting, or if it is an internal expl3 command with `__⟨module⟩` in its name, in which case we refuse to patch.
3. If the command was defined in nonstandard catcode settings, we will try a few standard ones to try our best to carry out the patching. If this doesn't help either, the code will give up and throw an error.

```

1 <@@=hook>
2 <*2kernel | latexrelease>
3 \ExplSyntaxOn
4 <latexrelease> \NewModuleRelease{2021/06/01}{ltxcmdhooks}
5 <latexrelease> {The~hook~management~system~for~commands}
```

### 4.2 Variables

Pairs of `\if<cmd>...\patch<cmd>` to be used with `\robust@command@act` when looking for a known patching rule. This token list is exposed because we see some future applications (with very specialized packages, such as `etoolbox` that may want to extend the pairs processed. It is not meant for general use which is why it is not documented in the interface documentation above.

```

6 \tl_new:N \g_hook_patch_action_list_tl

(End definition for \g_hook_patch_action_list_tl.)
```

The number of arguments in a macro being patched.

```

7 \int_new:N \l__hook_patch_num_args_int

(End definition for \l__hook_patch_num_args_int.)
```

<sup>14</sup>It's not always possible to reliably detect this case because a command defined with no optional argument is indistinguishable from a `\defed` command.

<code>\l__hook_patch_prefixes_tl</code>	The prefixes and parameters of the definition for the macro being patched.
<code>\l__hook_param_text_tl</code>	8 <code>\tl_new:N \l__hook_patch_prefixes_tl</code>
<code>\l__hook_replace_text_tl</code>	9 <code>\tl_new:N \l__hook_param_text_tl</code>
	10 <code>\tl_new:N \l__hook_replace_text_tl</code>
	(End definition for <code>\l__hook_patch_prefixes_tl</code> , <code>\l__hook_param_text_tl</code> , and <code>\l__hook_replace_text_tl</code> .)
<code>\c__hook_hash_tl</code>	A constant token list that contains two parameter tokens.
	11 <code>\tl_const:Nn \c__hook_hash_tl { # # }</code>
	(End definition for <code>\c__hook_hash_tl</code> .)
<code>\__hook_exp_not:NN</code>	Two temporary macros that change depending on the macro being patched.
<code>\__hook_def_cmd:w</code>	12 <code>\cs_new_eq:NN \__hook_exp_not:NN ?</code>
	13 <code>\cs_new_eq:NN \__hook_def_cmd:w ?</code>
	(End definition for <code>\__hook_exp_not:NN</code> and <code>\__hook_def_cmd:w</code> .)
<code>\q__hook_recursion_tail</code>	Internal quarks for recursion: they can't appear in any macro being patched.
<code>\q__hook_recursion_stop</code>	14 <code>\quark_new:N \q__hook_recursion_tail</code>
	15 <code>\quark_new:N \q__hook_recursion_stop</code>
	(End definition for <code>\q__hook_recursion_tail</code> and <code>\q__hook_recursion_stop</code> .)
<code>\g__hook_delayed_patches_prop</code>	A list containing the patches delayed to <code>\begin{document}</code> , so that patching is not attempted twice.
	16 <code>\prop_new:N \g__hook_delayed_patches_prop</code>
	(End definition for <code>\g__hook_delayed_patches_prop</code> .)
<code>\__hook_patch_debug:x</code>	A helper for patching debug info.
	17 <code>\cs_new_protected:Npn \__hook_patch_debug:x #1</code>
	18 <code>{ \__hook_debug:n { \iow_term:x { [lthooks]~#1 } } }</code>
	(End definition for <code>\__hook_patch_debug:x</code> .)

### 4.3 Variants

<code>\tl_rescan:nV</code>	<code>expl3</code> function variants used throughout the code.
	19 <code>\cs_generate_variant:Nn \tl_rescan:nn { nV }</code>
	(End definition for <code>\tl_rescan:nV</code> .)

## 4.4 Patching or delaying

Before `\begin{document}` all patching is delayed.

```

\__hook_try_put_cmd_hook:n This function is called from within \AddToHook, when code is first added to a generic cmd
\__hook_try_put_cmd_hook:w hook. If it is called within in the preamble, it delays the action until \begin{document};
                           otherwise it tries to update the hook.
20 <latexrelease>\IncludeInRelease{2021/11/15}{\__hook_try_put_cmd_hook:n}%
21 <latexrelease>          {Standardise-generic-hook-names}
22 \cs_new_protected:Npn \__hook_try_put_cmd_hook:n #1
23   { \__hook_try_put_cmd_hook:w #1 / / / \s__hook_mark {#1} }
24 \cs_new_protected:Npn \__hook_try_put_cmd_hook:w
25   #1 / #2 / #3 / #4 \s__hook_mark #5
26   {
27     \__hook_debug:n { \iow_term:n { ->~Adding~cmd-hook-to~'##2'~(##3): } }
28     \exp_args:Nc \__hook_patch_cmd_or_delay:Nnn {##2} {##2} {##3}
29   }
30 <latexrelease>\EndIncludeInRelease
31 <latexrelease>\IncludeInRelease{2021/06/01}{\__hook_try_put_cmd_hook:n}%
32 <latexrelease>          {Standardise-generic-hook-names}
33 <latexrelease>\cs_new_protected:Npn \__hook_try_put_cmd_hook:n #1
34 <latexrelease>  { \__hook_try_put_cmd_hook:w #1 / / / \s__hook_mark {#1} }
35 <latexrelease>\cs_new_protected:Npn \__hook_try_put_cmd_hook:w
36 <latexrelease>  #1 / #2 / #3 / #4 \s__hook_mark #5
37 <latexrelease>  {
38 <latexrelease>    \__hook_debug:n { \iow_term:n { ->~Adding~cmd-hook-to~'##2'~(##3): } }
39 <latexrelease>    \str_case:nnTF {##3}
40 <latexrelease>      { { before } { } { after } { } }
41 <latexrelease>      { \exp_args:Nc \__hook_patch_cmd_or_delay:Nnn {##2} {##2} {##3} }
42 <latexrelease>      { \msg_error:nnnn { hooks } { wrong-cmd-hook } {##2} {##3} }
43 <latexrelease>    }
44 <latexrelease>\EndIncludeInRelease

```

(End definition for `\__hook_try_put_cmd_hook:n` and `\__hook_try_put_cmd_hook:w`.)

`\__hook_patch_cmd_or_delay:Nnn` In the preamble, `\__hook_patch_cmd_or_delay:Nnn` just adds the patch instruction to a property list to be executed later.

```

\__hook_cmd_begindocument_code:
45 \cs_new_protected:Npn \__hook_patch_cmd_or_delay:Nnn #1 #2 #3
46   {
47     \__hook_debug:n { \iow_term:n { ->~Add-generic-cmd-hook-for~##2~(##3). } }
48     \__hook_debug:n
49       { \iow_term:n { !~In-the-preamble:~delaying. } }
50     \prop_gput:Nnn \g__hook_delayed_patches_prop { #2 / #3 }
51     { \__hook_cmd_try_patch:nn {##2} {##3} }
52   }

```

The delayed patches are added to a property list to prevent duplication, and the code stored in the property list for each key is executed. The function `\__hook_patch_cmd_or_delay:Nnn` is also redefined to be `\__hook_patch_command:Nnn` so that no further delaying is attempted.

```

53 \cs_new_protected:Npn \__hook_cmd_begindocument_code:
54   {
55     \cs_gset_eq:NN \__hook_patch_cmd_or_delay:Nnn \__hook_patch_command:Nnn
56     \prop_map_function:NN \g__hook_delayed_patches_prop { \use_i:nn }

```

```

57 \prop_gclear:N \g__hook_delayed_patches_prop
58 \cs_undefine:N \__hook_cmd_beginndocument_code:
59 }
60 \g@addto@macro \@kernel@after@begindocument
61 { \__hook_cmd_beginndocument_code: }

```

(End definition for \\_\_hook\_patch\_cmd\_or\_delay:Nnn and \\_\_hook\_cmd\_beginndocument\_code:.)

`\__hook_cmd_try_patch:nn` At `\begin{document}` tries patching the command if the hook was not manually created in the meantime. If the document does not exist, no error is raised here as it may hook into a package that wasn't loaded. Hooks added to commands in the document body still raise an error if the command is not defined.

```

62 \cs_new_protected:Npn \__hook_cmd_try_patch:nn #1 #2
63 {
64   \__hook_debug:n
65   { \iow_term:x { ->~\string\begin{document}~try~cmd / #1 / #2. } }
66   \__hook_if_declared:nTF { cmd / #1 / #2 }
67   {
68     \__hook_debug:n
69     { \iow_term:n { .->~Giving-up:~hook-already-created. } }
70   }
71   {
72     \cs_if_exist:cT {#1}
73     { \exp_args:Nc \__hook_patch_command:Nnn {#1} {#1} {#2} }
74   }
75 }

```

(End definition for \\_\_hook\_cmd\_try\_patch:nn.)

## 4.5 Patching commands

`\__hook_patch_command:Nnn` `\__hook_patch_command:Nnn` will do some sanity checks on the argument to detect if it is possible to add hooks to the command, and raises an error otherwise. If the command can contain hooks, then it uses `\robust@command@act` to find out what type is the command, and patch it accordingly.

```

76 \cs_new_protected:Npn \__hook_patch_command:Nnn #1 #2 #3
77 {
78   \__hook_patch_debug:x { analyzing~'\token_to_str:N #1' }
79   \__hook_patch_debug:x { \token_to_str:N #1 = \token_to_meaning:N #1 }
80   \__hook_patch_check:NNnn \cs_if_exist:NTF #1 { undef }
81   {
82     \__hook_patch_debug:x { ++~control~sequence~is~defined }
83     \__hook_patch_check:NNnn \token_if_macro:NTF #1 { macro }
84     {
85       \__hook_patch_debug:x { ++~control~sequence~is~a~macro }
86       \__hook_patch_check:NNnn \__hook_if_public_command:NTF #1 { expl3 }
87       {
88         \__hook_patch_debug:x { ++~macro~is~not~private }
89         \robust@command@act
90         \g_hook_patch_action_list_tl #1
91         \__hook_retokenize_patch:Nnn { #1 {#2} {#3} }
92       }
93     }
94   }

```

95 }

And here's the auxiliary used above:

```
96 \cs_new_protected:Npn \__hook_patch_check:NNnn #1 #2 #3 #4
97 {
98   #1 #2 {#4}
99   {
100     \msg_error:nnxx { hooks } { cant-patch }
101     { \token_to_str:N #2 } {#3}
102   }
103 }
```

and a conditional `\__hook_if_public_command:N` to check if a command has `__` in its name (no other checking is performed). Primitives with `:D` in their name could be included here, but they are already discarded in the `\token_if_macro:NTF` test above.

```
104 \use:x
105 {
106   \prg_new_protected_conditional:Npnn
107     \exp_not:N \__hook_if_public_command:N ##1 { TF }
108   {
109     \exp_not:N \exp_last_unbraced:Nf
110     \exp_not:N \__hook_if_public_command:w
111     { \exp_not:N \cs_to_str:N ##1 }
112     \tl_to_str:n { _ _ } \s__hook_mark
113   }
114 }
115 \exp_last_unbraced:NNNNo
116 \cs_new_protected:Npn \__hook_if_public_command:w
117   #1 \tl_to_str:n { _ _ } #2 \s__hook_mark
118 {
119   \tl_if_empty:nTF {#2}
120   { \prg_return_true: }
121   { \prg_return_false: }
122 }
```

(End definition for `\__hook_patch_command:Nnn` and others.)

#### 4.5.1 Patching by expansion and redefinition

`\g_hook_patch_action_list_tl` This is the list of known command types and the function that patches the command hooks into them. The conditionals are taken from `\ShowCommand`, `\NewCommandCopy` and `\__kernel_cmd_if_xparse:NTF` defined in `ltxcmd`.

```
123 \tl_gset:Nn \g_hook_patch_action_list_tl
124 {
125   { \@if@DeclareRobustCommand \__hook_patch_DeclareRobustCommand:Nnn }
126   { \@if@newcommand \__hook_patch_newcommand:Nnn }
127   { \__kernel_cmd_if_xparse:NTF \__hook_cmd_patch_xparse:Nnn }
128 }
```

(End definition for `\g_hook_patch_action_list_tl`.)

`\__hook_patch_DeclareRobustCommand:Nnn` At this point we know that the commands can be patched by expanding then redefining. These are the cases of commands defined with `\newcommand` with an optional argument or with `\DeclareRobustCommand`.

With `\__hook_patch_DeclareRobustCommand:Nnn` we check if the command has an optional argument (with a test counter-intuitively called `\@if@newcommand`; also make sure the command doesn't take args by calling `\robust@command@chk@safe`). If so, we pass the patching action to `\__hook_patch_newcommand:Nnn`, otherwise we call the patching engine `\__hook_patch_expand_redefine:NNnn` with a `\c_false_bool` to indicate that there is no optional argument.

```

129 \cs_new_protected:Npn \__hook_patch_DeclareRobustCommand:Nnn #1
130 {
131   \exp_args:Nc \__hook_patch_DeclareRobustCommand_aux:Nnn
132     { \cs_to_str:N #1 ~ }
133 }
134 \cs_new_protected:Npn \__hook_patch_DeclareRobustCommand_aux:Nnn #1
135 {
136   \robust@command@chk@safe #1
137   { \@if@newcommand #1 }
138   { \use_ii:nn }
139   { \__hook_patch_newcommand:Nnn }
140   { \__hook_patch_expand_redefine:NNnn \c_false_bool }
141   #1
142 }

```

(End definition for `\__hook_patch_DeclareRobustCommand:Nnn`.)

`\__hook_patch_newcommand:Nnn` If the command was defined with `\newcommand` and an optional argument, call the patching engine with a `\c_true_bool` to flag the presence of an optional argument, and with `\command` to patch the actual code for `\command`.

```

143 \cs_new_protected:Npn \__hook_patch_newcommand:Nnn #1
144 {
145   \exp_args:NNc \__hook_patch_expand_redefine:NNnn \c_true_bool
146     { \c_backslash_str \cs_to_str:N #1 }
147 }

```

(End definition for `\__hook_patch_newcommand:Nnn`.)

`\__hook_cmd_patch_xparse:Nnn` And for commands defined by the `xparse` commands use this for patching:

```

148 \cs_new_protected:Npn \__hook_cmd_patch_xparse:Nnn #1
149 {
150   \exp_args:NNc \__hook_patch_expand_redefine:NNnn \c_false_bool
151     { \cs_to_str:N #1 ~ code }
152 }

```

(End definition for `\__hook_cmd_patch_xparse:Nnn`.)

`\__hook_patch_expand_redefine:NNnn`  
`\__hook_redefine_with_hooks:NNnn`  
`\__hook_make_prefixes:w` Now the real action begins. Here we have in `#1` a boolean indicating if the command has a leading [...] delimited argument, in `#2` the command control sequence, in `#3` the name of the command (note that `#1 ≠ \csname#2\endcsname` at this point!), and in `#4` the hook position, either `before` or `after`.

Patching with expansion+redefinition is trickier than it looks like at first glance. Suppose the simple definition:

```
\def\foo#1{#1##2}
```

When defined, its *replacement text* will be a token list containing:



*out\_param 1, mac\_param #, character 2*

Then, after expanding `\foo{##1}` (here `##` denotes a single `#6`) we end up with a token list with *out\_param 1* replaced:

*mac\_param #, character 1, mac\_param #, character 2*

that is, the definition would be:

```
\def\foo#1{#1#2}
```

which obviously fails, because the original input in the definition was `##` but `TeX` reduced that to a single parameter token `#6` when carrying out the definition. That leaves no room for a clever solution with (say) `\unexpanded`, because anything that would double the second `#6`, would also (incorrectly) double the first, so there's not much to do other than a manual solution.

There are three cases we can distinguish to make things hopefully faster on simpler cases:

1. a macro with no parameters;
2. a macro with no parameter tokens in its definition;
3. a macro with parameters *and* parameter tokens.

The first case is trivial: if the macro has no parameters, we can just use `\unexpanded` around it, and if there is a parameter token in it, it is handled correctly (the macro can be treated as a `tl` variable).

The second case requires looking at the *<replacement text>* of the macro to see if it has a parameter token in there. If it does not, then there is no worry, and the macro can be redefined normally (without `\unexpanded`).

The third case, as usual, is the devious one. Here we'll have to loop through the definition token by token, and double every parameter token, so that this case can be handled like the previous one.

```
153 \cs_new_protected:Npn \__hook_patch_expand_redefine:NNnn #1 #2 #3 #4
154 {
155   \__hook_patch_debug:x { ++command-can-be-patched-without-rescanning }
We'll start by counting the number of arguments in the command by counting the number
of characters in the \cs_argument_spec:N of the macro, divided by two, and subtracting
one if the command has an optional argument (that is, an extra [] in its <parameter text>).
156   \int_set:Nn \l__hook_patch_num_args_int
157   {
158     \exp_args:Nf \str_count:n { \cs_argument_spec:N #2 } / 2
159     \bool_if:NT #1 { -1 }
160   }
```

Now build two token lists:

`\l__hook_param_text_tl` will contain the *<parameter text>* to be used when redefining the macro. It should be identical to the *<parameter text>* used when originally defining that macro.

`\l__hook_replace_text_tl` will contain braced pairs of `\c__hook_hash_tl<num>` to feed to the macro when expanded. This token list as well as the previous will have the first item surrounded by `[...]` in the case of an optional argument.

The use of `\c__hook_hash_tl` here is to differentiate actual parameters in the macro from parameter tokens in the original definition of the macro. Later on, `\c__hook_hash_tl` is either replaced by actual parameter tokens, or expanded into them.

```
161 \int_compare:nNnTF { \l__hook_patch_num_args_int } > { \c_zero_int }
162 {
```

We'll first check if the command has any parameter token in its definition (feeding it empty arguments), and set `\__hook_exp_not:n` accordingly. `\__hook_exp_not:n` will be used later to either leave `\c__hook_hash_tl` or expand it, and also to remember the result of `\__hook_if_has_hash:nTF` to avoid testing twice (the test can be rather slow).

```
163 \tl_set:Nx \l__hook_tmpa_tl { \bool_if:NTF #1 { [ ] } { { } } }
164 \int_step_inline:nnn { 2 } { \l__hook_patch_num_args_int }
165 { \tl_put_right:Nn \l__hook_tmpa_tl { { } } }
166 \exp_args:NNo \exp_args:No \__hook_if_has_hash:nTF
167 { \exp_after:wN #2 \l__hook_tmpa_tl }
168 { \cs_set_eq:NN \__hook_exp_not:n \exp_not:n }
169 { \cs_set_eq:NN \__hook_exp_not:n \use:n }
170 \cs_set_protected:Npn \__hook_tmp:w ##1 ##2
171 {
172   ##1 \l__hook_param_text_tl { \use:n ##2 }
173   ##1 \l__hook_replace_text_tl { \__hook_exp_not:n {##2} }
174 }
```

Here we'll conditionally add [...] around the first parameter:

```
175 \bool_if:NTF #1
176 { \__hook_tmp:w \tl_set:Nx { [ \c__hook_hash_tl 1 ] } }
177 { \__hook_tmp:w \tl_set:Nx { { \c__hook_hash_tl 1 } } }
```

Then, for every parameter from the second, just add it normally:

```
178 \int_step_inline:nnn { 2 } { \l__hook_patch_num_args_int }
179 { \__hook_tmp:w \tl_put_right:Nx { { \c__hook_hash_tl ##1 } } }
```

Now, if the command has any parameter token in its definition (then `\__hook_exp_not:n` is `\exp_not:n`), call `\__hook_double_hashes:n` to double them, and replace every `\c__hook_hash_tl` by #:

```
180 \tl_set:Nx \l__hook_replace_text_tl
181 { \exp_not:N #2 \exp_not:V \l__hook_replace_text_tl }
182 \tl_set:Nx \l__hook_replace_text_tl
183 {
184   \token_if_eq_meaning:NNTF \__hook_exp_not:n \exp_not:n
185   { \exp_args:NNV \exp_args:No \__hook_double_hashes:n }
186   { \exp_args:NV \exp_not:o }
187   \l__hook_replace_text_tl
188 }
```

And now, set a few auxiliaries for the case that the macro has parameters, so it won't be passed through `\unexpanded` (twice):

```
189 \cs_set_eq:NN \__hook_def_cmd:w \tex_gdef:D
190 \cs_set_eq:NN \__hook_exp_not:NN \prg_do_nothing:
191 }
192 {
```

In the case the macro has no parameters, we'll treat it as a token list and things are much simpler (expansion control looks a bit complicated, but it's just a pair of `\exp_not:n` preventing another `\exp_not:n` from expanding):

```

193     \tl_clear:N \l__hook_param_text_tl
194     \tl_set_eq:NN \l__hook_replace_text_tl #2
195     \cs_set_eq:NN \__hook_def_cmd:w \tex_xdef:D
196     \cs_set:Npn \__hook_exp_not:NN ##1 { \exp_not:N ##1 \exp_not:N }
197 }

```

Before redefining, we need to also get the prefixes used when defining the command. Here we ensure that the `\escapechar` is printable, otherwise a macro defined with prefixes `\protected` `\long` will have it `\meaning` printed as `protectedlong`, making life unnecessarily complicated. Here the `\escapechar` is changed to `/`, then we loop between pairs of `/.../` extracting the prefixes.

```

198 \group_begin:
199   \int_set:Nn \tex_escapechar:D { '/' }
200   \use:x
201   {
202     \group_end:
203     \tl_set:Nx \exp_not:N \l__hook_patch_prefixes_tl
204     { \exp_not:N \__hook_make_prefixes:w \cs_prefix_spec:N #2 / / }
205   }

```

Finally, call `\__hook_redefine_with_hooks:Nnnn` with the macro being redefined in `#1`, then `\UseHook{cmd/<name>/before}` in `#2` or `\UseHook{cmd/<name>/after}` in `#3` (one is always empty), and in `#4` the *<replacement text>* of the macro.

```

206 \use:x
207 {
208   \__hook_redefine_with_hooks:Nnnn \exp_not:N #2
209   \str_if_eq:nnTF {#4} { after }
210   { \use_ii_i:nn }
211   { \use:nn }
212   { { \__hook_exp_not:NN \exp_not:N \UseHook { cmd / #3 / #4 } } }
213   { { } }
214   { \__hook_exp_not:NN \exp_not:N \l__hook_replace_text_tl }
215 }
216 }

```

Now that all the needed tools are ready, without further ado we'll redefine the command. The definition uses the prefixes gathered in `\l__hook_patch_prefixes_tl`, a primitive `\__hook_def_cmd:w` (which is `\tex_gdef:D` or `\tex_xdef:D`) to avoid adding extra prefixes, and the *<parameter text>* from `\l__hook_param_text_tl`.

Then finally, in the body of the definition, we insert `#2`, which is `cmd/#1/before` or empty, `#4` which is the *<replacement text>*, and `#3` which is `cmd/#1/after` or empty.

```

217 \cs_new_protected:Npn \__hook_redefine_with_hooks:Nnnn #1 #2 #3 #4
218 {
219   \l__hook_patch_prefixes_tl
220   \exp_after:wN \__hook_def_cmd:w
221   \exp_after:wN #1 \l__hook_param_text_tl
222   { #2 #4 #3 }
223 }

```

Here's the auxiliary that makes the prefix control sequences for the redefinition. Each item has to be `\tl_trim_spaces:n`'d because the last item (and not any other) has a trailing space.

```

224 \cs_new:Npn \__hook_make_prefixes:w / #1 /
225 {

```

```

226 \tl_if_empty:nF {#1}
227 {
228   \exp_not:c { tex_ \tl_trim_spaces:n {#1} :D }
229   \__hook_make_prefixes:w /
230 }
231 }

```

(End definition for `\__hook_patch_expand_redefine:NNnn`, `\__hook_redefine_with_hooks:Nnnn`, and `\__hook_make_prefixes:w`.)

Here are some auxiliaries for the contraption above.

`\__hook_if_has_hash_p:n` `\__hook_if_has_hash:nTF` searches the token list #1 for a catcode 6 token, and if any is found, it returns true, and false otherwise. The searching doesn't care about preserving groups or spaces: we can ignore those safely (braces are removed) so that searching is as fast as possible.

```

232 \prg_new_conditional:Npnn \__hook_if_has_hash:n #1 { TF }
233 { \__hook_if_has_hash:w #1 ## \s__hook_mark }
234 \cs_new:Npn \__hook_if_has_hash:w #1
235 {
236   \tl_if_single_token:nTF {#1}
237   {
238     \token_if_eq_catcode:NNTF ## #1
239     { \__hook_if_has_hash_check:w }
240     { \__hook_if_has_hash:w }
241   }
242   { \__hook_if_has_hash:w #1 }
243 }
244 \cs_new:Npn \__hook_if_has_hash_check:w #1 \s__hook_mark
245 { \tl_if_empty:nTF {#1} { \prg_return_false: } { \prg_return_true: } }

```

(End definition for `\__hook_if_has_hash:nTF`, `\__hook_if_has_hash:w`, and `\__hook_if_has_hash_check:w`.)

`\__hook_double_hashes:n` `\__hook_double_hashes:w` loops through the token list #1 and duplicates any catcode 6 token, and expands tokens `\ifx-equal` to `\c__hook_hash_tl`, and leaves all other tokens `\notexpanded` with `\exp_not:N`. Unfortunately pairs of explicit catcode 1 and catcode 2 character tokens are normalised to `{_1}` and `}_1` because it's not feasible to expandably detect the character code (*maybe* it could be done using something along the lines of <https://tex.stackexchange.com/a/527538>, but it's far too much work for close to zero benefit).

`\__hook_double_hashes:w` is the tail-recursive loop macro, that tests which of the three types of item is in the head of the token list.

```

246 \cs_new:Npn \__hook_double_hashes:n #1
247 { \__hook_double_hashes:w #1 \q__hook_recursion_tail \q__hook_recursion_stop }
248 \cs_new:Npn \__hook_double_hashes:w #1 \q__hook_recursion_stop
249 {
250   \tl_if_head_is_N_type:nTF {#1}
251   { \__hook_double_hashes_output:N }
252   {
253     \tl_if_head_is_group:nTF {#1}
254     { \__hook_double_hashes_group:n }
255     { \__hook_double_hashes_space:w }
256   }
257   #1 \q__hook_recursion_stop

```

```

258 }
    \__hook_double_hashes_output:N checks for the end of the token list, then checks
    if the token is \c__hook_hash_tl, and if so just leaves it.
259 \cs_new:Npn \__hook_double_hashes_output:N #1
260 {
261   \if_meaning:w \q__hook_recursion_tail #1
262   \__hook_double_hashes_stop:w
263   \fi:
264   \if_meaning:w \c__hook_hash_tl #1
    (this \use_i:nnnn uses \fi: and consumes \use:n, the whole \if_catcode:w block,
    and the \exp_not:N, leaving just #1 which is \c__hook_hash_tl.)
265   \use_i:nnnn
266   \fi:
267   \use:n
268   {
    If #1 is not \c__hook_hash_tl, then check if its catcode is 6, and if so, leave it doubled
    in \exp_not:n and consume the following \exp_not:N #1.
269     \if_catcode:w ## \exp_not:N #1
270     \exp_after:wN \use_ii:nnnn
271     \fi:
272     \use_none:n
273     { \exp_not:n { #1 #1 } }
274   }
    If both previous tests returned false, then leave the token unexpanded and resume the
    loop.
275   \exp_not:N #1
276   \__hook_double_hashes:w
277 }
278 \cs_new:Npn \__hook_double_hashes_stop:w #1 \q__hook_recursion_stop { \fi: }
    Dealing with spaces and grouped tokens is trivial:
279 \cs_new:Npn \__hook_double_hashes_group:n #1
280 { { \__hook_double_hashes:n {#1} } \__hook_double_hashes:w }
281 \exp_last_unbraced:NNo
282 \cs_new:Npn \__hook_double_hashes_space:w \c_space_tl
283 { ~ \__hook_double_hashes:w }
    (End definition for \__hook_double_hashes:n and others.)

```

#### 4.5.2 Patching by retokenization

At this point we've drained the possibilities of patching a command by expansion-and-redefinition, so we have to resort to patching by retokenizing the command. Patching by retokenization is done by getting the `\meaning` of the command, doing the necessary manipulations on the generated string, and the retokenizing that again by using `\scantokens`.

Patching by retokenization is definitely a riskier business, because it relies that the tokens printed by `\meaning` produce the exact same tokens as the ones in the original definition. That is, the catcode régime must be exactly(ish) the same, and there is no way of telling except by trial and error.

`\__hook_retokenize_patch:Nnn` This is the macro that will control the whole process. First we'll try out one final, rather trivial case, of a command with no arguments; that is, a token list. This case can be patched with the expand-and-redefine routine but it has to be the very last case tested for, because most (all?) robust commands start with a top-level macro with no arguments, so testing this first would short-circuit `\robust@command@act` and the top-level macros would be incorrectly patched. In that case, we just check if the `\cs_argument_spec:N` is empty, and call `\__hook_patch_expand_redefine:NNnn`.

```

284 \cs_new_protected:Npn \__hook_retokenize_patch:Nnn #1 #2 #3
285 {
286   \__hook_patch_debug:x { ..~command-can-only-be-patched-by-rescanning }
287   \str_if_eq:eeTF { \cs_argument_spec:N #1 } { }
288   { \__hook_patch_expand_redefine:NNnn \c_false_bool #1 {#2} {#3} }
289   {

```

Otherwise, we start the actual patching by retokenization job. The code calls `\__hook_try_patch_with_catcodes:Nnnnw` with a different catcode setting:

- The current catcode setting;
- Switching the catcode of `@`;
- Switching the `expl3` syntax on or off;
- Both of the above.

If patching succeeds, `\__hook_try_patch_with_catcodes:Nnnnw` has the side-effect of patching the macro `#1` (which may be an internal from the command whose name is `#2`).

```

290   \tl_set:Nx \l__hook_tmpa_tl
291   {
292     \int_compare:nNnTF { \char_value_catcode:n {'\@ } } = { 12 }
293     { \exp_not:N \makeatletter } { \exp_not:N \makeatother }
294   }
295   \tl_set:Nx \l__hook_tmpb_tl
296   {
297     \bool_if:NTF \l__kernel_expl_bool
298     { \ExplSyntaxOff } { \ExplSyntaxOn }
299   }
300   \use:x
301   {
302     \exp_not:N \__hook_try_patch_with_catcodes:Nnnnw
303     \exp_not:n { #1 {#2} {#3} }
304     { \prg_do_nothing: }
305     { \exp_not:V \l__hook_tmpa_tl } % @
306     { \exp_not:V \l__hook_tmpb_tl } % _:
307     {
308       \exp_not:V \l__hook_tmpa_tl   % @
309       \exp_not:V \l__hook_tmpb_tl   % _:
310     }
311   }
312   \q_recursion_tail \q_recursion_stop

```

If no catcode setting succeeds, give up and raise an error. The command isn't changed in any way in that case.

```

313   {
314     \msg_error:nnxx { hooks } { cant-patch }

```

```

315         { \c_backslash_str #2 } { retok }
316     }
317 }
318 }

```

(End definition for `\__hook_retokenize_patch:Nnn`.)

`\__hook_try_patch_with_catcodes:Nnnnw`

This function is a simple wrapper around `\__hook_cmd_if_scanable:NnTF` and `\__hook_patch_retokenize:Nnnn` if the former returns *true*, plus some debug messages.

```

319 \cs_new_protected:Npn \__hook_try_patch_with_catcodes:Nnnnw #1 #2 #3 #4
320 {
321     \quark_if_recursion_tail_stop_do:nn {#4} { \use:n }
322     \__hook_patch_debug:x { ++~trying~to~patch~by~retokenization }
323     \__hook_cmd_if_scanable:NnTF {#1} {#4}
324     {
325         \__hook_patch_debug:x { ++~macro~can~be~retokenized~cleanly }
326         \__hook_patch_debug:x { ==~retokenizing~macro~now }
327         \__hook_patch_retokenize:Nnnn #1 {#2} {#3} {#4}
328         \use_i_delimit_by_q_recursion_stop:nw \use_none:n
329     }
330     {
331         \__hook_patch_debug:x { ---macro~cannot~be~retokenized~cleanly }
332         \__hook_try_patch_with_catcodes:Nnnnw #1 {#2} {#3}
333     }
334 }

```

(End definition for `\__hook_try_patch_with_catcodes:Nnnnw`.)

`\kerneltmpDoNotUse`

This is an oddity required to be safe (as safe as reasonably possible) when patching the command. The entirety of

`\(prefixes) \def <cs> <parameter text> {\(replacement text)}`

will go through `\scantokens`. The *<parameter text>* and *<replacement text>* are what we are trying to retokenize, so not much worry there. The other items, however, should “just work”, so some care is needed to not use too fancy catcode settings. Therefore we can’t use an `expl3`-named macro for *<cs>*, nor the `expl3` versions of `\def` or the *<prefixes>*. That is why the definitions that will eventually go into `\scantokens` will use the oddly (but hopefully clearly)-named `\kerneltmpDoNotUse`:

```

335 \cs_new_eq:NN \kerneltmpDoNotUse !

```

*PhO: Maybe this can be avoided by running the <parameter text> and the <replacement text> separately through \scantokens and then putting everything together at the end.*

(End definition for `\kerneltmpDoNotUse`.)

`\__hook_patch_required_catcodes:`

Here are the catcode settings that are *mandatory* when retokenizing commands. These are the minimum necessary settings to perform the definitions: they identify control sequences, which must be escaped with `\_0`, delimit the definition with `{_1` and `_2}`, and mark parameters with `_6`. Everything else may be changed, but not these.

```

336 \cs_new_protected:Npn \__hook_patch_required_catcodes:
337 {
338     \char_set_catcode_escape:N \_
339     \char_set_catcode_group_begin:N \_{
340     \char_set_catcode_group_end:N \_}

```

```

341 \char_set_catcode_parameter:N \#
342 % \int_set:Nn \tex_endlinechar:D { -1 }
343 % \int_set:Nn \tex_newlinechar:D { -1 }
344 }

```

*PhO: etoolbox sets the \endlinechar and \newlinechar when patching, but as far as I tested these didn't make much of a difference, so I left them out for now. Maybe \newlinechar=-1 avoids a space token being added after the definition.*

*PhO: If the patching is split by ⟨parameter text⟩ and ⟨replacement text⟩, then only # will have to stay in that list.*

*PhO: Actually now that we patch \UseHook{cmd/foo/before}, all the tokens there need to have the right catcodes, so this list now includes all lowercase letters, U and H, the slash, and whatever characters in the command name... sigh...*

(End definition for \\_\_hook\_patch\_required\_catcodes:.)

\\_\_hook\_cmd\_if\_scanable:NnTF Here we'll do a quick test if the command being patched can in fact be retokenized with the specific catcode setting without changing in meaning. The test is straightforward:

1. apply \meaning to the command;
2. split the ⟨prefixes⟩, ⟨parameter text⟩ and ⟨replacement text⟩ and arrange them as  

$$\langle\text{prefixes}\rangle\backslash\text{def}\backslash\text{kerneltmpDoNotUse}\langle\text{parameter text}\rangle\{\langle\text{replacement text}\rangle\}$$
3. rescan that with the given catcode settings, and do the definition; then finally
4. compare \kerneltmpDoNotUse with the original command.

If both are \ifx-equal, the command can be safely patched.

```

345 \prg_new_protected_conditional:Npnn \__hook_cmd_if_scanable:Nn #1 #2 { TF }
346 {
347   \cs_set_eq:NN \kerneltmpDoNotUse \scan_stop:
348   \cs_set_eq:NN \__hook_tmp:w \scan_stop:
349   \use:x
350   {
351     \cs_set:Npn \__hook_tmp:w
352       #####1 \tl_to_str:n { macro: } #####2 -> #####3 \s__hook_mark
353       { #####1 \def \kerneltmpDoNotUse #####2 {#####3} }
354     \tl_set:Nx \exp_not:N \l__hook_tmpa_tl
355       { \exp_not:N \__hook_tmp:w \token_to_meaning:N #1 \s__hook_mark }
356   }
357   \tl_rescan:nV { #2 \__hook_patch_required_catcodes: } \l__hook_tmpa_tl
358   \token_if_eq_meaning:NNTF #1 \kerneltmpDoNotUse
359   { \prg_return_true: }
360   { \prg_return_false: }
361 }

```

(End definition for \\_\_hook\_cmd\_if\_scanable:NnTF.)

\\_\_hook\_patch\_retokenize:Nnnn Then, if \\_\_hook\_cmd\_if\_scanable:NnTF returned true, we can go on and patch the command.

```

362 \cs_new_protected:Npn \__hook_patch_retokenize:Nnnn #1 #2 #3 #4
363 {

```



Start off by making some things `\relax` to avoid lots of `\noexpand` below.

```
364 \cs_set_eq:NN \kerneltmpDoNotUse \scan_stop:
365 \cs_set_eq:NN \__hook_tmp:w \scan_stop:
366 \use:x
367 {
```

Now we'll define `\__hook_tmp:w` such that it splits the `\meaning` of the macro (`#1`) into its three parts:

```
####1. <prefixes>
####2. <parameter text>
####3. <replacement text>
```

and arrange that a complete definition, then place the `before` or `after` hooks around the `<replacement text>`: accordingly.

```
368 \cs_set:Npn \__hook_tmp:w
369   ####1 \tl_to_str:n { macro: } ####2 -> ####3 \s__hook_mark
370 {
371   ####1 \def \kerneltmpDoNotUse ####2
372   {
373     \str_if_eq:nnT {#3} { before }
374     { \token_to_str:N \UseHook { cmd / #2 / #3 } }
375     ####3
376     \str_if_eq:nnT {#3} { after }
377     { \token_to_str:N \UseHook { cmd / #2 / #3 } }
378   }
379 }
```

Now we just have to get the `\meaning` of the command being patched and pass it through the meat grinder above.

```
380 \tl_set:Nx \exp_not:N \l__hook_tmpa_tl
381 { \exp_not:N \__hook_tmp:w \token_to_meaning:N #1 \s__hook_mark }
382 }
```

Now rescan with the given catcode settings (overridden by the `\__hook_patch_required_catcodes:`), and implicitly (by using the rescanned token list) carry out the definition from above.

```
383 \tl_rescan:nV { #4 \__hook_patch_required_catcodes: } \l__hook_tmpa_tl
```

And to close, copy the newly-defined command into the old name and the patching is finally completed:

```
384 \cs_gset_eq:NN #1 \kerneltmpDoNotUse
385 }
```

(End definition for `\__hook_patch_retokenize:Nnnn.`)

## 4.6 Messages

```
386 <latexrelease> \IncludeInRelease{2021/11/15}{wrong-cmd-hook}%
387 <latexrelease> {Standardise-generic-hook-names}
388 <latexrelease> \EndIncludeInRelease
389 <latexrelease> \IncludeInRelease{2021/11/15}{wrong-cmd-hook}%
390 <latexrelease> {Standardise-generic-hook-names}
391 <latexrelease> \msg_new:nnnn { hooks } { wrong-cmd-hook }
```

```

392 <latexrelease> {
393 <latexrelease>   Generic-hook~‘cmd/#1/#2’~is~invalid.
394 <latexrelease>%   The~hook~should~be~‘cmd/#1/before’~or~‘cmd/#1/after’.
395 <latexrelease> }
396 <latexrelease> {
397 <latexrelease>   You~tried~to~add~a~generic~hook~to~command~\iow_char:N \#1,~but~‘#2’~
398 <latexrelease>   is~an~invalid~component.~Only~‘before’~or~‘after’~are~allowed.
399 <latexrelease> }
400 <latexrelease>\EndIncludeInRelease
401 \msg_new:nnnn { hooks } { cant-patch }
402 {
403   Generic-hooks~cannot~be~added~to~‘#1’.
404 }
405 {
406   You~tried~to~add~a~hook~to~‘#1’,~but~LaTeX~was~unable~to~
407   patch~the~command~because~it~\__hook_unpatchable_cases:n {#2}.
408 }
409 \cs_new:Npn \__hook_unpatchable_cases:n #1
410 {
411   \str_case:nn {#1}
412   {
413     { undef } { doesn’t~exist }
414     { macro } { is~not~a~macro }
415     { expl3 } { is~a~private~expl3~macro }
416     { retok } { can’t~be~retokenized~cleanly }
417   }
418 }
419 <latexrelease>\IncludeInRelease{0000/00/00}{ltxcmdhooks}%
420 <latexrelease>   {The~hook~management~system~for~commands}
421 <latexrelease>

The command \__hook_cmd_begindocument_code: is used in an internal hook, so we
need to make sure it has a harmless definition after rollback as that will not remove it
from the kernel hook.
422 <latexrelease>\cs_set_eq:NN \__hook_cmd_begindocument_code: \prg_do_nothing:
423 <latexrelease>
424 <latexrelease>\EndModuleRelease
425 \ExplSyntaxOff
426 </2ekernel | latexrelease>
427 <@@=>

```

# File j

## lalloc.dtx

### 1 Counters

This section deals with counter and other variable allocation.

1 `\*2kernel`

The following are from plain T<sub>E</sub>X:

`\z@` A zero dimen or number. It's more efficient to write `\parindent\z@` than `\parindent 0pt`.

`\@ne` The number 1.

`\m@ne` The number  $-1$ .

`\tw@` The number 2.

`\sist@@n` The number 16.

`\@m` The number 1000.

`\@MM` The number 20000.

`\@xxxii` The constant 32.

2 `\chardef\@xxxii=32`

*(End definition for \@xxxii.)*

`\@Mi` Constants 10001–10004.

`\@Mii` 3 `\mathchardef\@Mi=10001`

`\@Miii` 4 `\mathchardef\@Mii=10002`

`\@Miv` 5 `\mathchardef\@Miii=10003`

6 `\mathchardef\@Miv=10004`

*(End definition for \@Mi and others.)*

`\@tempcnta` Scratch count registers used by L<sup>A</sup>T<sub>E</sub>X kernel commands.

`\@tempcntb` 7 `\newcount\@tempcnta`

8 `\newcount\@tempcntb`

*(End definition for \@tempcnta and \@tempcntb.)*

`\if@tempswa` General boolean switch used by L<sup>A</sup>T<sub>E</sub>X kernel commands.

9 `\newif\if@tempswa`

*(End definition for \if@tempswa.)*

`\@tempdima` Scratch dimen registers used by L<sup>A</sup>T<sub>E</sub>X kernel commands.

`\@tempdimb` 10 `\newdimen\@tempdima`

`\@tempdimc` 11 `\newdimen\@tempdimb`

12 `\newdimen\@tempdimc`

*(End definition for \@tempdima, \@tempdimb, and \@tempdimc.)*

`\@tempboxa` Scratch box register used by L<sup>A</sup>T<sub>E</sub>X kernel commands.  
<sup>13</sup> `\newbox\@tempboxa`  
*(End definition for \@tempboxa.)*

`\@tempskipa` Scratch skip registers used by L<sup>A</sup>T<sub>E</sub>X kernel commands.  
`\@tempskipb` <sup>14</sup> `\newskip\@tempskipa`  
<sup>15</sup> `\newskip\@tempskipb`  
*(End definition for \@tempskipa and \@tempskipb.)*

`\@temptokena` Scratch token register used by L<sup>A</sup>T<sub>E</sub>X kernel commands.  
<sup>16</sup> `\newtoks\@temptokena`  
*(End definition for \@temptokena.)*

`\@flushglue` Glue used for `\right-` & `\leftskip = 0pt` plus 1fil  
<sup>17</sup> `\newskip\@flushglue \@flushglue = 0pt plus 1fil`  
*(End definition for \@flushglue.)*  
<sup>18</sup> `\</2ekernel>`

# File k

## ltcntrl.dtx

### 1 Program control structure

This section defines a number of control structure macros, such as while-loops and for-loops.

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

```

1 <*2kernel>
2 \message{control,}

```

```

\@whilenum TEST \do {BODY}
\@whiledim TEST \do {BODY} : These implement the loop
    while TEST do BODY od
    where TEST is a TeX \ifnum or \ifdim test, respectively.
    They are optimized for the normal case of TEST initially false.

```

```

\@whilesw SWITCH \fi {BODY} : Implements the loop
    while SWITCH do BODY od
    Optimized for normal case of SWITCH initially false.

```

```

\@for NAME := LIST \do {BODY} : Assumes that LIST expands to A1,A2,
    ... ,An .
    Executes BODY n times, with NAME = Ai on the i-th iteration.
    Optimized for the normal case of n = 1. Works for n=0.

```

```

\@tfor NAME := LIST \do {BODY}
    if, before expansion, LIST = T1 ... Tn where each Ti is a
    token or {...}, then executes BODY n times, with NAME = Ti
    on the i-th iteration. Works for n=0.

```

NOTES: 1. These macros use no \@temp sequences.  
 2. These macros do not work if the body contains anything that looks syntactically to TeX like an improperly balanced \if \else \fi.

```

\@whilenum TEST \do {BODY} ==
BEGIN
    if TEST
    then BODY
        \@iwhilenum{TEST \relax BODY}
    END

```

```

\@iwhilenum {TEST BODY} ==
BEGIN
    if TEST
    then BODY

```

```

        \@nextwhile = def(\@iwhilenum)
    else \@nextwhile = def(\@whilenoop)
    fi
    \@nextwhile {TEST BODY}
END

\@whilesw SWITCH \fi {BODY} ==
BEGIN
    if SWITCH
    then BODY
        \@iwhilesw {SWITCH BODY}\fi
    fi
END

\@iwhilesw {SWITCH BODY} \fi ==
BEGIN
    if SWITCH
    then BODY
        \@nextwhile = def(\@iwhilesw)
    else \@nextwhile = def(\@whileswnoop)
    fi
    \@nextwhile {SWITCH BODY} \fi
END

```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

```

\@whilenoop
\@whilenum    3 \long\def\@whilenum#1\do #2{\ifnum #1\relax #2\relax\@iwhilenum{#1\relax
\@iwhilenum    4     #2\relax}\fi}
               5 \long\def\@iwhilenum#1{\ifnum #1\expandafter\@iwhilenum
               6     \else\expandafter\@gobble\fi{#1}}

```

*(End definition for \@whilenoop, \@whilenum, and \@iwhilenum.)*

```

\@whiledim
\@iwhiledim   7 \long\def\@whiledim#1\do #2{\ifdim #1\relax#2\@iwhiledim{#1\relax#2}\fi}
               8 \long\def\@iwhiledim#1{\ifdim #1\expandafter\@iwhiledim
               9     \else\expandafter\@gobble\fi{#1}}

```

*(End definition for \@whiledim and \@iwhiledim.)*

```

\@whileswnoop
\@whilesw     10 \long\def\@whilesw#1\fi#2{#1#2\@iwhilesw{#1#2}\fi\fi}
\@iwhilesw    11 \long\def\@iwhilesw#1\fi{#1\expandafter\@iwhilesw
               12     \else\@gobbletwo\fi{#1}\fi}

```

(End definition for \@whileswnoop, \@whilesw, and \@iwhilesw.)

Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):

```
\@for NAME := LIST \do {BODY} ==
  BEGIN \@forloop expand(LIST),\@nil,\@nil \@@ NAME {BODY} END
```

```
\@forloop CAR, CARCDR, CDRCDR \@@ NAME {BODY} ==
  BEGIN
    NAME = CAR
    if def(NAME) = def(\@nnil)
      else BODY;
      NAME = CARCDR
      if def(NAME) = def(\@nnil)
        else BODY
          \@iforloop CDRCDR \@@ NAME \do {BODY}
        fi
      fi
  END
```

```
\@iforloop CAR, CDR \@@ NAME {BODY} =
  NAME = CAR
  if def(NAME) = def(\@nnil)
    then \@nextwhile = def(\@fornoop)
    else BODY ;
      \@nextwhile = def(\@iforloop)
    fi
  \@nextwhile name cdr {body}
```

```
\@tfor NAME := LIST \do {BODY}
  = \@tforloop LIST \@nil \@@ NAME {BODY}
```

```
\@tforloop car cdr \@@ name {body} =
  name = car
  if def(name) = def(\@nnil)
    then \@nextwhile == \@fornoop
    else body ;
      \@nextwhile == \@forloop
    fi
  \@nextwhile name cdr {body}
```

End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.

\@nnil

```
13 \def\@nnil{\@nil}
```

(End definition for \@nnil.)

\@empty

```
14 \def\@empty{}
```

(End definition for \@empty.)

```

\@fornoop
15 \long\def\@fornoop#1\@@#2#3{}
(End definition for \@fornoop.)

\@for
16 \long\def\@for#1:=#2\do#3{%
17   \expandafter\def\expandafter\@fortmp\expandafter{#2}%
18   \ifx\@fortmp\@empty \else
19     \expandafter\@forloop#2,\@nil,\@nil\@@#1{#3}\fi}
(End definition for \@for.)

\@forloop
20 \long\def\@forloop#1,#2,#3\@@#4#5{\def#4{#1}\ifx #4\@nnil \else
21   #5\def#4{#2}\ifx #4\@nnil \else#5\@iforloop #3\@@#4{#5}\fi\fi}
(End definition for \@forloop.)

\@iforloop
22 \long\def\@iforloop#1,#2\@@#3#4{\def#3{#1}\ifx #3\@nnil
23   \expandafter\@fornoop \else
24   #4\relax\expandafter\@iforloop\fi#2\@@#3{#4}}
(End definition for \@iforloop.)

\@tfor
25 \def\@tfor#1:={\@tf@r#1 }
26 \long\def\@tf@r#1#2\do#3{\def\@fortmp{#2}\ifx\@fortmp\space\else
27   \@tforloop#2\@nil\@nil\@@#1{#3}\fi}
28 \long\def\@tforloop#1#2\@@#3#4{\def#3{#1}\ifx #3\@nnil
29   \expandafter\@fornoop \else
30   #4\relax\expandafter\@tforloop\fi#2\@@#3{#4}}
(End definition for \@tfor.)

\@break@tfor Break out of a \@tfor loop. This should be called inside the scope of an \if. See
\@iffileonpath for an example.
31 \long\def\@break@tfor#1\@@#2#3{\fi\fi}
(End definition for \@break@tfor.)

\@removeelement Removes an element from a comma-separated list and puts it into a control se-
quence, called as \@removeelement{<element>}{<list>}{<cs>}. Due to the implemen-
tation method the <element> is not allowed to contain braces.
32 \def\@removeelement#1#2#3{%
33   \def\reserved@a##1,#1,##2\reserved@a{##1,##2\reserved@b}%
34   \def\reserved@b##1,\reserved@b##2\reserved@b{%
35     \ifx,##1\@empty\else##1\fi}%
36   \edef#3{%
37     \expandafter\reserved@b\reserved@a,#2,\reserved@b,#1,\reserved@a}}
(End definition for \@removeelement.)
38 </2ekernel>

```



## File l

# lterror.dtx

## 1 Error handling and tracing

This section defines L<sup>A</sup>T<sub>E</sub>X's error commands.

```
1 <*2kernel>
```

The ‘2kernel’ code ensures that a `\usepackage{autoerr}` is essentially ignored if a ‘full’ format is being used that has the error messages already in the format.

These days we don't support autoloading approach any longer, but this part bit is kept in case it is used in old documents.

```
2 \expandafter\let\csname ver@autoerr.sty\endcsname\fmtversion
```

### 1.1 General commands

**\MessageBreak** This command prints a new-line inside a message, followed by a continuation line begun with `\@msg@continuation`. Normally it is defined to be `\relax`, but inside messages, it is let to `\@message@break`.

```
3 \let\MessageBreak\relax
```

*(End definition for \MessageBreak.)*

**\GenericInfo** This takes two arguments: a continuation and a message, and sends the result to the log file.

```
4 \DeclareRobustCommand{\GenericInfo}[2]{%
5   \begingroup
6     \def\MessageBreak{^^J#1}%
7     \set@display@protect
8     \immediate\write\m@ne{#2\on@line.}%
9   \endgroup
10 }
```

*(End definition for \GenericInfo.)*

**\GenericWarning** This takes two arguments: a continuation and a message, and sends the result to the screen.

```
11 \DeclareRobustCommand{\GenericWarning}[2]{%
12   \begingroup
13     \def\MessageBreak{^^J#1}%
14     \set@display@protect
15     \immediate\write\@unused{^^J#2\on@line.^^J}%
16   \endgroup
17 }
```

*(End definition for \GenericWarning.)*

`\GenericError` This macro takes four arguments: a continuation, an error message, where to go for further information, and the help information. It displays the error message, and sets the error help (the result of typing `h` to the prompt), and does a horrible hack to turn the last context line (which by default is the only context line) into just three dots. This could be made more efficient.

```

18 \bgroup
19 \lccode'\@=' \ %
20 \lccode'\~=' \ %
21 \lccode'\}=' \ %
22 \lccode'\{=' \ %
23 \lccode'\T=' \T%
24 \lccode'\H=' \H%
25 \catcode'\ =11\relax%
26 \lowercase{%
27 \egroup%
```

Unfortunately  $\text{\TeX}$  versions older than 3.141 have a bug which means that `^^J` does not force a linebreak in `\message` and `\errmessage` commands. So for these old  $\text{\TeX}$ 's we use `\typeout` to produce the message, and then have an empty `\errmessage` command. This causes an extra line of the form

.

To appear on the terminal, but if you do not like it, you can always upgrade your  $\text{\TeX}$ ! In order for your format to use this version, you must define the macro `\TeXversion` to be the version number, e.g., 3.14 of the underlying  $\text{\TeX}$ . See the comments in `ltdircheck.dtx`.

```

28 \dimen@ifx\TeXversion\@undefined4\else\TeXversion\fi\p@%
29 \ifdim\dimen@>3.14\p@%
    First the 'standard case'.
30 \DeclareRobustCommand{\GenericError}[4]{%
31 \begingroup%
32 \immediate\write\@unused{}%
33 \def\MessageBreak{^^J}%
34 \set@display@protect%
35 \edef%
36 % %<-----do not delete this space!----->%
37 \@err@
38 {{#4}}%
39 \errhelp
40 % %<-----do not delete this space!----->%
41 \@err@
42 \let
43 % %<-----do not delete this space!----->%
44 \@err@
45 \@empty
46 \def\MessageBreak{^^J#1}%
47 \def~{\errmessage{%
48 #2.^^J^^J%
49 #3^^J%
50 Type H <return> for immediate help%
51 % %<-----do not delete this space!----->%
52 \@err@
```

```

53 }}%
54 ~%
55 \endgroup}%
56 \else%
    Secondly the version for old TEX's.
57 \DeclareRobustCommand{\GenericError}[4]{%
58 \begingroup%
59 \immediate\write\@unused{}%
60 \def\MessageBreak{^^J}%
61 \set@display@protect%
62 \edef%
63 %    %<-----do not delete this space!----->%
64 \@err@
65 {{#4}}%
66 \errhelp
67 %    %<-----do not delete this space!----->%
68 \@err@
69 \let
70 %    %<-----do not delete this space!----->%
71 \@err@
72 \errmessage
73 \def\MessageBreak{^^J#1}%
74 \def~{\typeout{! %
75 #2.^^J^^J%
76 #3^^J%
77 Type H <return> for immediate help.}%
78 %    %<-----do not delete this space!----->%
79 \@err@
80 {}}%
81 ~%
82 \endgroup}%
83 \fi}%

```

(End definition for \GenericError.)

<code>\PackageError</code> <code>\PackageWarning</code> <code>\PackageWarningNoLine</code> <code>\PackageInfo</code> <code>\ClassError</code> <code>\ClassWarning</code> <code>\ClassWarningNoLine</code> <code>\ClassInfo</code>	<p>These commands are intended for use by package and class writers, to give information to authors. The syntax is:</p> <pre> \PackageError{&lt;package&gt;}{&lt;error&gt;}{&lt;help&gt;} \PackageWarning{&lt;package&gt;}{&lt;warning&gt;} \PackageWarningNoLine{&lt;package&gt;}{&lt;warning&gt;} \PackageInfo{&lt;package&gt;}{&lt;info&gt;} </pre>
--	--

and similarly for classes. The `Error` commands print the `<error>` message, and present the interactive prompt; if the author types `h`, then the `<help>` information is displayed. The `Warning` commands produce a warning but do not present the interactive prompt. The `WarningNoLine` commands do the same, but don't print the input line number. The `Info` commands write the message to the `log` file. Within the messages, the command `\MessageBreak` can be used to break a line, `\protect` can be used to protect command names, and `\space` is a space, for example:

```

\newcommand{\foo}{F00}
\PackageWarning{ethel}{%
  Your hovercraft is full of eels,\MessageBreak
  and \protect\foo\space is \foo}

```

produces:

```

Package ethel warning: Your hovercraft is full of eels,
(ethel)                and \foo is F00 on input line 54.

```

```

84 \gdef\PackageError#1#2#3{%
85   \GenericError{%
86     (#1)\@spaces\@spaces\@spaces\@spaces
87   }{%
88     Package #1 Error: #2%
89   }{%
90     See the #1 package documentation for explanation.%
91   }{#3}%
92 }
93 \def\PackageWarning#1#2{%
94   \GenericWarning{%
95     (#1)\@spaces\@spaces\@spaces\@spaces
96   }{%
97     Package #1 Warning: #2%
98   }%
99 }
100 \def\PackageWarningNoLine#1#2{%
101   \PackageWarning{#1}{#2\@gobble}%
102 }
103 \def\PackageInfo#1#2{%
104   \GenericInfo{%
105     (#1) \@spaces\@spaces\@spaces
106   }{%
107     Package #1 Info: #2%
108   }%
109 }
110 \gdef\ClassError#1#2#3{%
111   \GenericError{%
112     (#1) \space\@spaces\@spaces\@spaces
113   }{%
114     Class #1 Error: #2%
115   }{%
116     See the #1 class documentation for explanation.%
117   }{#3}%
118 }
119 \def\ClassWarning#1#2{%
120   \GenericWarning{%
121     (#1) \space\@spaces\@spaces\@spaces
122   }{%
123     Class #1 Warning: #2%
124   }%
125 }
126 \def\ClassWarningNoLine#1#2{%

```

```

127 \ClassWarning{#1}{#2@gobble}%
128 }
129 \def\ClassInfo#1#2{%
130 \GenericInfo{%
131 (#1) \space\space\@spaces\@spaces
132 }{%
133 Class #1 Info: #2%
134 }%
135 }

```

(End definition for \PackageError and others.)

```

\ClassNote
\ClassNoteNoLine 136 </2ekernel>
\PackageNote      137 <*2ekernel | latexrelease>
\PackageNoteNoLine 138 <latexrelease> \IncludeInRelease{2021/11/15}%
                  139 <latexrelease> \ClassNote{Notes for classes/packages}%
140 \def\ClassNote#1#2{%
141 \GenericWarning{%
142 (#1) \space\space\@spaces\@spaces
143 }{%
144 Class #1 Info: #2%
145 }%
146 }
147 \def\ClassNoteNoLine#1#2{\ClassNote{#1}{#2@gobble}}
148 \def\PackageNote#1#2{%
149 \GenericWarning{%
150 (#1) \@spaces\@spaces\@spaces
151 }{%
152 Package #1 Info: #2%
153 }%
154 }
155 \def\PackageNoteNoLine#1#2{\PackageNote{#1}{#2@gobble}}
156 </2ekernel | latexrelease>
157 <latexrelease> \EndIncludeInRelease

```

We don't roll back, because if this code is used by packages then most often they will not have rollback code implemented, so they would immediately break even if they otherwise would work fine.

```

158 <latexrelease> \IncludeInRelease{0000/00/00}%
159 <latexrelease> \ClassNote{Notes for classes/packages}%
160 <latexrelease>
161 <latexrelease> \EndIncludeInRelease
162 <*2ekernel>

```

(End definition for \ClassNote and others.)

```

\@latex@error      Errors and other info, for use in the LATEX core.
\@latex@warning    163 \gdef\@latex@error#1#2{%
\@latex@warning@no@line 164 \GenericError{%
\@latex@info          165 \space\space\space\@spaces\@spaces\@spaces
\@latex@info@no@line 166 }{%
167 LaTeX Error: #1%
168 }%

```

```

169     See the LaTeX manual or LaTeX Companion for explanation.%
170   }{#2}%
171 }

```

```

172 \def\@latex@warning#1{%
173   \GenericWarning{%
174     \space\space\space\@spaces\@spaces\@spaces
175   }{%
176     LaTeX Warning: #1%
177   }%
178 }

```

```

179 \def\@latex@warning@no@line#1{%
180   \@latex@warning{#1\@gobble}}

```

```

181 \def\@latex@info#1{%
182   \GenericInfo{%
183     \@spaces\@spaces\@spaces
184   }{%
185     LaTeX Info: #1%
186   }%
187 }

```

```

188 \def\@latex@info@no@line#1{%
189   \@latex@info{#1\@gobble}}

```

\@font@warning and \@font@info are defined later since they have to be redefined by the tracefnt package.

```

def\@font@warning#1{%
  \GenericWarning{%
    {(font)\@spaces\@spaces}%
    {Font Warning: #1}%
  }
def\@font@info#1{%
  \GenericInfo{%
    (font)\space\@spaces
  }{%
    Font Info: #1%
  }%
}

```

*(End definition for \@latex@error and others.)*

\@latex@note These are “info” messages that display on the terminal not just in the transcript.  
\@latex@note@no@line

```

190 </2ekernel>
191 <*2ekernel | latexrelease>
192 <latexrelease>\IncludeInRelease{2021/11/15}%
193 <latexrelease>{\@latex@note}{Display notes}%
194 \def\@latex@note#1{%
195   \GenericWarning{%
196     \@spaces\@spaces\@spaces
197   }{%
198     LaTeX Info: #1%
199   }%
200 }

```

```

201 \def\@latex@note@no@line#1{%
202   \@latex@note{#1@gobble}}

```

We don't make them undefined but rather point to `\@latex@info` because that's what they replace. This way we can change `\@latex@info` elsewhere without the need to further rollback sections.

```

203 </2ekernel | latexrelease>
204 <latexrelease>\EndIncludeInRelease
205 <latexrelease>\IncludeInRelease{0000/00/00}%
206 <latexrelease>          {\@latex@note}{Display notes}%
207 <latexrelease>
208 <latexrelease>\let\@latex@note\@latex@info
209 <latexrelease>\let\@latex@note@no@line\@latex@info@no@line
210 <latexrelease>\EndIncludeInRelease
211 <*2ekernel>

```

*(End definition for \@latex@note and \@latex@note@no@line.)*

**\c@errorcontextlines** `\errorcontextlines` as a L<sup>A</sup>T<sub>E</sub>X counter, so that it may be manipulated with `\setcounter` (once it is defined :-)

```

212 \let\c@errorcontextlines\errorcontextlines
213 \c@errorcontextlines=-1

```

*(End definition for \c@errorcontextlines.)*

**\on@line** The message ‘ on input line *n*’.

```

214 \def\on@line{ on input line \the\inputlineno}

```

*(End definition for \on@line.)*

**\@warning** Older L<sup>A</sup>T<sub>E</sub>X messages. For the moment, these `\let` to the new message commands. They may be changed later, once only obsolete packages and classes contain them.

```

\@warning
\@warning
\@latexerr
215 \let\@warning\@latex@warning
216 \let\@@warning\@latex@warning@no@line
217 \global\let\@latexerr\@latex@error

```

*(End definition for \@warning, @@warning, and \@latexerr.)*

**\@spaces** Four spaces.

```

218 \def\@spaces{\space\space\space\space}

```

*(End definition for \@spaces.)*

## 1.2 Specific errors

**\@eha** The more common error help messages.

```

\@ehb
219 \gdef\@eha{%
\@ehc
220   Your command was ignored.\MessageBreak
\@ehd
221   Type \space I <command> <return> \space to replace it %
222   with another command,\MessageBreak
223   or \space <return> \space to continue without it.}
224 \gdef\@ehb{%
225   You've lost some text. \space \@ehc}
226 \gdef\@ehc{%
227   Try typing \space <return> %

```

```

228 \space to proceed.\MessageBreak
229 If that doesn't work, type \space X <return> \space to quit.}
230 \gdef\@ehd{%
231 You're in trouble here. \space\@ehc}

(End definition for \@eha and others.)

\@notdefinable Error message generated in \@ifdefinable from calls to one of the commands \newcommand,
\newlength or \newtheorem specifying an already-defined command name or one that
begins \end....
232 \gdef\@notdefinable{%
233 \@latex@error{%
234 Command \@backslashchar\reserved@a\space
235 already defined.\MessageBreak
236 Or name \@backslashchar\@qend... illegal,
237 see p.192 of the manual}\@eha}

(End definition for \@notdefinable.)

\@nolnerr Generated by \newline and \\ when called in vertical mode.
238 \gdef\@nolnerr{%
239 \@latex@error{There's no line here to end}\@eha}

(End definition for \@nolnerr.)

\@nocounterr Generated by \setcounter, \addtocounter or \newcounter if applied to an undefined
counter <cnt>.

\@nocnterr Obsolete error message generated in LATEX2.09 by \setcounter, \addtocounter or
\newcounter for undefined counter. DO NOT use for LATEX 2ε it MIGHT vanish! Use
\@nocounterr{<cnt>} instead.
240 \gdef\@nocounterr#1{%
241 \@latex@error{No counter '#1' defined}\@eha}
242 \gdef\@nocnterr{\@nocounterr?}

(End definition for \@nocounterr and \@nocnterr.)

\@ctrerr Called when trying to print the value of a counter numbered by letters that's greater
than 26.
243 \gdef\@ctrerr{%
244 \@latex@error{Counter too large}\@ehb}

(End definition for \@ctrerr.)

\@nodocument Error produced if paragraphs are typeset in the preamble.
245 \gdef\@nodocument{%
246 \@latex@error{Missing \protect\begin{document}}\@ehd}

(End definition for \@nodocument.)

```



`\@badend` Called by `\end` that doesn't match its `\begin`. RmS 1992/08/24: added code to `\@badend` to display position of non-matching `\begin`. FMi 1993/01/14: missing space added.

The environment name has to literally match, i.e., what is stored in `\@currentvir` (after one expansion) must match what is passed to `\end` (without expansion). If not we complain. Not the absolute best solution but at least it avoids getting `\begin{foo}` ended by `\end{foo}` which was possible in the past.

```
247 \gdef\@badend#1{%
248   \latex@error{\protect\begin
249     {\detokenize\expandafter{\@currentvir}}\@currentvline
250     \space ended by \protect\end{\detokenize{#1}}}\@eha}
```

*(End definition for \@badend.)*

`\@badmath` Called by `\[, \]`, `\(` or `\)` when used in wrong mode.

```
251 \gdef\@badmath{%
252   \latex@error{Bad math environment delimiter}\@eha}
```

*(End definition for \@badmath.)*

`\@toodeep` Called by a list environment nested more than six levels deep, or an `enumerate` or `itemize` nested more than four levels.

```
253 \gdef\@toodeep{%
254   \latex@error{Too deeply nested}\@ehd}
```

*(End definition for \@toodeep.)*

`\@badpoptabs` Called by `\endtabbing` when not enough `\poptabs` have occurred, or by `\poptabs` when too many have occurred.

```
255 \gdef\@badpoptabs{%
256   \latex@error{\protect\pushtabs\space and \protect\poptabs
257     \space don't match}\@ehd}
```

*(End definition for \@badpoptabs.)*

`\@badtab` Called by `\>`, `\+`, `\-` or `\<` when stepping to an undefined tab.

```
258 \gdef\@badtab{%
259   \latex@error{Undefined tab position}\@ehd}
```

*(End definition for \@badtab.)*

`\@preamerr` This error is special: it appears in places where we normally have to `\protect` expansions. However, to prevent a protection of the error message itself (which would result in the message getting printed not issued on the terminal) we need to locally reset `\protect` to `\relax`.

```
260 \gdef\@preamerr#1{%
261   \begingroup
262     \let\protect\relax
263     \latex@error{\ifcase #1 Illegal character\or
264       Missing @-exp\or Missing p-arg\fi\space
265       in array arg}\@ehd
266   \endgroup}
```

*(End definition for \@preamerr.)*

`\@badlinearg` Occurs in `\line` and `\vector` command when a bad slope argument is encountered.

```

267 \gdef\@badlinearg{%
268   \latex@error{%
269     Bad \protect\line\space or \protect\vector
270     \space argument}\@ehb}

```

*(End definition for \@badlinearg.)*

`\@parmoderr` Occurs in a float environment or a `\marginpar` when encountered in inner vertical mode.

```

271 \gdef\@parmoderr{%
272   \latex@error{Not in outer par mode}\@ehb}

```

*(End definition for \@parmoderr.)*

`\@fltovf` Occurs in float environment or `\marginpar` when there are no more free boxes for storing floats.

```

273 \gdef\@fltovf{%
274   \latex@error{Too many unprocessed floats}\@ehb}

```

*(End definition for \@fltovf.)*

`\@latexbug` Occurs in output routine. This is bad news.

```

275 \gdef\@latexbug{%
276   \latex@error{This may be a LaTeX bug}{Call for help}}

```

*(End definition for \@latexbug.)*

`\@badcrerr` This error was removed and replaced by `\@nolnerr`.

```

277 %\def\@badcrerr {\latex@error{Bad use of \protect\\}\@ehc}

```

*(End definition for \@badcrerr.)*

`\@noitemerr` `\addvspace` or `\addpenalty` was called when not in vmode. Probably caused by a missing `\item`.

```

278 \gdef\@noitemerr{%
279   \latex@error{Something's wrong--perhaps a missing %
280     \protect\item}\@ehc}

```

*(End definition for \@noitemerr.)*

`\@notprerr` A command that can be used only in the preamble appears after the command `\begin{document}`.

```

281 \gdef\@notprerr{%
282   \latex@error{Can be used only in preamble}\@eha}

```

*(End definition for \@notprerr.)*

`\@inmatherr` Issued by commands that don't work correctly within math (like `\item`). There is no real error recovery happening, e.g., the user might get additional errors afterwards.

```

283 \gdef\@inmatherr#1{%
284   \relax
285   \ifmmode
286     \latex@error{Command \protect#1 invalid in math mode}\@ehc
287     \fi}

```

(End definition for \inmatherr.)

`\@invalidchar` An error for use with invalid characters. This is commented out, since we decided to use catcode 15 instead.

```
288 %\def\@invalidchar{\@latexerror{Invalid character in input}\@ehc}
```

(End definition for \@invalidchar.)

As well as the above error commands some error messages are directly coded to save space. The messages already present in L<sup>A</sup>T<sub>E</sub>X2.09 include:

**Environment --- undefined**

Issued by `\begin` for undefined environment.

**Tab overflow**

Occurs in `\=` when maximum number of tabs exceeded.

**\< in mid line**

Occurs in `\<` when it appears in middle of line.

**Float(s) lost**

In output routine, caused by a float environment or `\marginpar` occurring in inner vertical mode.

### 1.3 Tracing

The `trace` package implements the commands `\traceon` and `\traceoff` that work similar to `\tracingall` but skip certain code blocks that produce a lot of tracing output being of no interest during debugging (for example loading a font). Code blocks that should be hidden during tracing need to be surrounded by the macros `\conditionally@traceoff` and `\conditionally@traceon`.

For the kernel code the `trace` package then redefines a number of macros to include this tracing support.

However, in order to allow any macro package to react to `\traceon` we also provide dummy definitions for the two commands in the kernel so that they can be used by external packages without the need to distinguish between `trace` being loaded or not.

`\conditionally@traceon` These are only dummy definitions. For details see the `trace` package.

`\conditionally@traceoff`

```
289 \let\conditionally@traceon\@empty
```

```
290 \let\conditionally@traceoff\@empty
```

(End definition for `\conditionally@traceon` and `\conditionally@traceoff`.)

```
291 \</2kernel>
```

# File m

## ltpar.dtx

### 1 Paragraphs

This section of the kernel declares the commands used to set `\par` and `\everypar` when ever their function needs to be changed for a long time.

This file here describes the interfaces that have been in the kernel forever, used to implement the scenarios described below. They remain valid but are now augmented in the next file (`ltpara.dtx`) to add hooks to paragraphs. At some point we will consolidate the two files further.

There are two situations in which `\par` may be changed:

- Long-term changes, in which the new value is to remain in effect until the current environment is left. The environments that change `\par` in this way are the following:
  - All list environments (itemize, quote, etc.)
  - Environments that turn `\par` into a noop: tabbing, array and tabular.
- Temporary changes, in which `\par` is restored to its previous value the next time it is executed. The following are all such uses.
  - `\end` when preceded by `\@endparenv`, which is called by `\endtrivlist`
  - The mechanism for avoiding page breaks and getting the spacing right after section heads.

#### 1.1 Implementation

`\@setpar` To permit the proper interaction of these two situations, long-term changes are made by the `\@setpar{<VAL>}` command. It's function is:

To set `\par`. It `\def`'s `\par` and `\@par` to `<VAL>`.

`\@restorepar` Short-term changes are made by the usual `\def\par` commands. The original values are restored after a short-term change by the `\@restorepar` commands.

`\@@par` `\@@par` always is defined to be the original TeX `\par`.

`\everypar` `\everypar` is changed only for the short term. Whenever `\everypar` is set non-null, it should restore itself to null when executed.

The following commands change `\everypar` in this way:

- `\item`
- `\end` when preceded by `\@endparenv`, which is called by `\endtrivlist`
- `\minipage`

When dealing with `\par` and `\everypar` remember the following two warnings:

1. Commands that make short-term changes to `\par` and `\everypar` must take account of the possibility that the new commands and the ones that do the restoration may be executed inside a group. In particular, `\everypar` is executed inside a group whenever a new paragraph begins with a left brace. The `\everypar` command that restores its definition should be local to the current group (in case the command is inside a minipage used inside someplace where `\everypar` has been redefined). Thus, if `\everypar` is redefined to do an `\everypar{}` it could take several executions of `\everypar` before the restoration “holds”. This usually causes no problem. However, to prevent the extra executions from doing harm, use a global switch to keep anything harmful in the new `\everypar` from being done twice.
2. Commands that change `\everypar` should remember that `\everypar` might be supposed to set the following switches false:

- `@nobreak`
- `@minipage`

they should do the setting if necessary.

```

1  \<2kernel>
2  \message{par,}

```

`\@setpar` Initiate a long-term change to `\par`.

```

\@par 3 \def\@setpar#1{\def\par{#1}\def\@par{#1}}

```

The default definition of `\@par` will ensure that if `\@restorepar` defines `\par` to execute `\@par` it will redefine itself to the primitive `\@@par` after one iteration.

```

4 \def\@par{\let\par\@@par\par}

```

*(End definition for \@setpar and \@par.)*

`\@restorepar` Restore from a short-term change to `\par`.

```

5 \def\@restorepar{\def\par{\@par}}
6 \</2kernel>

```

*(End definition for \@restorepar.)*

# File n

## ltpara.dtx

### Abstract

This code defines four special kernel hooks to support paragraph tagging as well as four public hooks which can be occasionally useful.

## 1 Introduction

The building of paragraphs in the T<sub>E</sub>X engine(s) has a number of peculiarities that makes it on one hand fairly flexible but on the other hand somewhat awkward to control or reliably to extend. Thus to better understand the code below we start with a brief introduction of the mechanism; for more details refer to the T<sub>E</sub>Xbook [?, chap. 14] (for the full truth you may even have to study the program code).

### 1.1 The default processing done by the engine

T<sub>E</sub>X automatically starts building a paragraph when it is currently in vertical mode and encounters anything that can only live in horizontal mode. Most often this is a character, but there are also many commands that can be used only in horizontal mode. If any of them is encountered, T<sub>E</sub>X will immediately back up (i.e., the character or command is read later again), adds a `\parskip` glue to the current vertical list unless the list is empty, switches to horizontal mode, starts its special “start of paragraph processing” and only then rereads the character or command that caused the mode change.<sup>15</sup>

This “start of paragraph processing” first adds an empty box at the start of the horizontal list of width `\parindent` (which represents the paragraph indentation) unless the paragraph was started with `\noindent` in which case no such box is added<sup>16</sup>. It then reads and processes all tokens stored in the special engine token register `\everypar`. After that it reads and processes whatever has caused the paragraph to start.

Thus out of the box, T<sub>E</sub>X offers the possibility to put some special code into `\everypar` to gain control at (more or less) the start of the paragraph. For example, in LaTeX and a number of packages, special code like the following is sometimes used:

```
\everypar{\setbox\z@\lastbox}\everypar{} ...}
```

This removes the paragraph indentation box again (that was already placed by T<sub>E</sub>X), then resets `\everypar` so that it doesn’t do anything on the next paragraph start and then does whatever it wants to do, e.g., in an `\item` of a list it will typeset the label in front of the paragraph text. However, there is only one such `\everypar` token register and if different packages and/or the kernel all attempt to add their own code here, coordination is very difficult if not impossible.

The process when the paragraph ends has different mechanisms and interfaces. A paragraph ends when the engine primitive `\par` is called while T<sub>E</sub>X is in unrestricted horizontal mode, i.e., is building a paragraph. At other times this primitive does nothing or generates as an error depending on the mode T<sub>E</sub>X is in, e.g., the `\par` in `\hbox{a\par b}` is ignored, but `$a\par b$` would complain.

---

<sup>15</sup>Already not quite true: the command `\noindent` starts the paragraph but influences the special processing by suppressing the paragraph indentation box normally inserted by it.

<sup>16</sup>That’s a bit different from placing a zero-sized box!

If this primitive ends the paragraph it does some special “end of horizontal list” processing, then calls  $\text{\TeX}$ ’s paragraph builder; this breaks the horizontal list into lines and then these lines are added as boxes to the enclosing vertical list and  $\text{\TeX}$  returns to vertical mode.

This  $\text{\par}$  command can be given explicitly, but there are also situations in which  $\text{\TeX}$  is generating it on the fly. Most often this happens when  $\text{\TeX}$  encounters a blank line which is automatically changed to a  $\text{\par}$  command which is then executed. The other possibility is that  $\text{\TeX}$  encounters a command which is incompatible with horizontal processing, e.g.,  $\text{\vskip}$  (a request for adding vertical space). In such cases it silently backs up, and inserts a  $\text{\par}$  in the hope that this gets it out of horizontal mode and makes the vertical command acceptable.

The important point to note here is that  $\text{\TeX}$  really inserts the command with the name  $\text{\par}$ , which can be redefined. Thus, it may not have its original “primitive” meaning and therefore may not end the horizontal list and call the paragraph builder. This approach offers some flexibility but also allows you to easily produce a  $\text{\TeX}$  document that loops forever, for example, the simple line

```
A \let\par\relax \vskip
```

will start a horizontal list at A, redefines  $\text{\par}$ , then sees  $\text{\vskip}$  and inserts  $\text{\par}$  to end the paragraph. But this now only runs  $\text{\relax}$  so nothing changes and  $\text{\vskip}$  is read again, issues a  $\text{\par}$  which .... In short, it only takes a plain  $\text{\TeX}$  document with five tokens to run forever (since no memory is consumed and therefore eventually exhausted).

There is no way other than changing  $\text{\par}$  to gain control at the end of a paragraph, i.e., there is no token list like  $\text{\everypar}$  that is inserted. Hence the only way to change the default behavior is to modify the action that  $\text{\par}$  executes, with similar issues as outlined before: different processes need to ensure that they do not overwrite their modifications or worse, think that the  $\text{\par}$  in front of them is the engine primitive while in fact it has already been changed by other code.

To make matters slightly worse there are a few places where  $\text{\TeX}$  handles the situation differently (most likely for speed reasons back when computers were much slower). If  $\text{\TeX}$  finds itself in unrestricted horizontal mode at the end of building a vertical box (for an  $\text{\insert}$ ,  $\text{\vadjust}$  or executing the output routine code), it will finish the horizontal list not by issuing a  $\text{\par}$  command (which would be consistent with all other places) but by simply executing the primitive meaning of  $\text{\par}$ , regardless of the actual definition that  $\text{\par}$  has at the time.

Thus, if you have carefully crafted a redefined  $\text{\par}$  to execute some special actions at the end of a paragraph and you write something like

```
\vbox{Some paragraph ... text.}
```

you will find that your code does not get run for the last paragraph in that box.  $\text{\LaTeX}$  avoids this problem, by making sure that its boxes (such as  $\text{\parbox}$  or the  $\text{\minipage}$  environment, etc.) all internally add an explicit  $\text{\par}$  at the end so that such code is run and  $\text{\TeX}$  finds itself in vertical mode already without the need to start up the paragraph builder internally. But, of course, this only works for boxes under direct control of the  $\text{\LaTeX}$  kernel; if some package uses low-level  $\text{\vboxes}$  without adding this precaution the  $\text{\TeX}$  optimization kicks in and no special  $\text{\par}$  code is executed.

And there is another optimization that is painful: if a paragraph is interrupted by a mathematical display, e.g.,  $\text{\[...]}$  in  $\text{\LaTeX}$  or  $\text{\$...\$}$  in plain  $\text{\TeX}$ , then  $\text{\TeX}$  will resume horizontal mode afterward, i.e., it will start to build a new horizontal list

without inserting an indentation box or `\everypar` at that point. However, if that list immediately ends with an explicit or implicit `\par` then  $\text{\TeX}$  will simply throw away this “null” paragraph and not do its usual “end of horizontal list” processing, so this special case also needs to be accounted for when introducing any extended processing.

## 2 The new mechanism implemented for $\text{\LaTeX}$

To improve the situation (and also to support automatic tagging of PDF documents) we now offer public as well as private hooks at the start and end of the paragraph processing. The public hooks can be used by packages (or by the user in the preamble or within the document) and using the hook mechanisms it is possible to reorder or arrange code from different packages in such a way that these can safely coexist.

To make that happen we have to make use of the basic functionality that is offered by  $\text{\TeX}$ , e.g., we install special code inside `\everypar` to provide hooks at the beginning and we redefine `\par` to do some special processing when appropriate to install hooks at the end of the paragraph.

In order to make this work, we have to ensure that package use of `\everypar` is not overwriting our code. This is done through a trick: we basically hide the real `\everypar` from the packages and offer them a new token register (with the same name). So if they install their own code it doesn’t overwrite ours. Our code then inserts the new `\everypar` at the right place inside the process so that it looks as if it was the primitive `\everypar`.<sup>17</sup>

At the end of the paragraph it would be great if we could use a similar trick. However, due to the fact that  $\text{\TeX}$  inserts the token `\par` (that doesn’t have a defined meaning) we can’t hide “the real thing<sup>TM</sup>” and offer the package an indistinguishable alternate.

Fortunately,  $\text{\LaTeX}$  has already redefined `\par` for its own purposes. As a result there aren’t many packages that attempt to change `\par`, because without a lot of extra care that would fail miserably. But the bottom line is that, if you load a package that alters `\par` then the end of paragraph hooks are most likely not executing while that redefinition is active.<sup>18</sup>

---

<sup>17</sup>Ideally, `\everypar` wouldn’t be used at all by packages and instead they would simply write their code into the hooks now offered by the kernel. However, while this is the longterm goal and clearly an improvement (because then the packages do no longer need to worry about getting their code overwritten or needing to account for already existing code in `\everypar`), this will not happen overnight. For that reason support for this legacy method is retained.

<sup>18</sup>Similarly to the `\everypar` situation, the remedy is that such packages stop doing this and instead add their alterations into the paragraph hooks now provided.



## 2.1 The provided hooks

---

<code>para/before</code>	The following four public hooks are defined and executed for each paragraph:
<code>para/begin</code>	
<code>para/end</code>	
<code>para/after</code>	

---

**para/before** This hook is executed after the kernel hook `\@kernel@before@para@before` (discussed below) in vertical mode immediately after  $\mathrm{T\!E\!X}$  has contributed `\parskip` to the vertical list and before the actual paragraph processing in horizontal mode starts.

This hook should either not produce any typeset material or add only vertical material. If it starts a paragraph an error is generated. The reason is that we are in the starting process of processing a paragraph and so this would lead to endless recursion.<sup>19</sup>

**para/begin** This hook is executed after the kernel hook `\@kernel@before@para@begin` (discussed below) in horizontal mode immediately before the indentation box is placed (if there is any, i.e., if the paragraph hasn't been started with `\noindent`).

The indentation box to be typeset is available to the hook as `\IndentBox` and its automatic placement (after the hook is executed) can be prevented through `\OmitIndent`. More precisely `\OmitIndent` voids the box.

The indentation box is then typeset directly after the hook execution by something equivalent to `\box\IndentBox` followed by the current content of the token register `\everypar` that it is available to the kernel or to packages (that run some legacy code).

One has to be careful not to add any code to the hook that starts its own paragraph (e.g., by adding a `\parbox` or a `\marginpar` inside) because that would call the hook inside again (as a new paragraph is started there) and thus lead to an endless recursion ending only after exhausting the available memory. This can only be done by making sure that is not executed for the inner paragraphs (or at least not recursively forever).

**para/end** This hook is executed at the end of a paragraph when  $\mathrm{T\!E\!X}$  is ready to return to vertical mode and after it has removed the last horizontal glue (but not any kerns) placed on the horizontal list. The code is still executed in horizontal mode so it is possible to add further horizontal material at this point, but it should not alter the mode (even a temporary exit from horizontal mode would create chaos—any attempt will cause an error message)! After the hook has ended the kernel hook `\@kernel@after@para@end` is executed and then  $\mathrm{T\!E\!X}$  returns to vertical mode.

The hook is offered as public hook, but because of the requirement to stay within horizontal mode one needs to be careful in what is placed into the hook.<sup>20</sup>

This hook is implemented as a reversed hook.

**para/after** This hook is executed directly after  $\mathrm{T\!E\!X}$  has returned to vertical mode and after any material that migrated out of the horizontal list (e.g., from a `\vadjust`) has processed.

---

<sup>20</sup>Maybe we should guard against that, but it would be rather tricky to implement as mode changes can happen across group boundaries so one would need to keep a private stack just for that. Well, something to ponder.

This hook should either not produce any typeset material or add only vertical material. However, for this hook starting a new paragraph is not a disaster so that it isn't prevented.

This hook is implemented as a reversed hook.

Once that hook code has been processed the kernel hook `\@kernel@after@para@after` is executed as the final action of the paragraph processing.

---

```
\@kernel@before@para@before
\@kernel@after@para@after
\@kernel@before@para@begin
\@kernel@after@para@end
```

---

As already mentioned above there are also four kernel hooks that are executed at the start and end of the processing.

`\@kernel@before@para@before` For future extensions, not currently used by the kernel.

`\@kernel@after@para@after` For future extensions, not currently used by the kernel.

`\@kernel@before@para@begin` Used by the kernel to implement tagging. This hook is executed at the very beginning of a paragraph after `TEX` has switched to horizontal mode but before any indentation box got added or any `\everypar` was run.

It should not generate typeset material that could alter the position. Note that it should never leave hmode, otherwise you will end with a loop! We could guard against this, but since it is an internal kernel hook that shouldn't be touched this isn't checked.

`\@kernel@after@para@end` Used by the kernel to implement tagging. It is executed directly after the public `para/end` hook. After it there is a quick check that we are still in horizontal mode, i.e., that the public hook has not mistakenly ended horizontal mode prematurely (this is an incomplete check just testing the mode and could perhaps be improved (at the cost of speed)).

## 2.2 Altered and newly provided commands

---

```
\par
\endgraf
\para_end:
```

---

An explicit request for ending a paragraph is provided in plain `TEX` under the name `\endgraf`, which simply uses the primitive meaning (regardless of what `\par` may have as its current definition). In `LATEX` `\endgraf` (with that behavior) was originally also available.

With the new paragraph handling in `LATEX`, ending a paragraph means a bit more than just calling the engine's paragraph builder: the process also has to add any hook code for the end of a paragraph. Thus `\endgraf` was changed to provide this additional functionality (along with `\par` remaining subject to its current meaning).

The `expl3` name for this functionality is `\para_end:`.

**Note:** *The next two commands are still under discussion and may slightly change their semantics (as described in the document) and/or their names between now and the 2021 Spring release!*

<hr/> <code>\OmitIndent</code> <code>\para_omit_indent:</code> <hr/>	<p>Inside the <code>para/begin</code> hook one can use this command to suppress the indentation box at the start of the paragraph. (Technically it is possible to use this command outside the hook as well, but this should not be relied upon.) The box itself remains available for use.</p> <p>The <code>expl3</code> name for the function is <code>\para_omit_indent:</code>.</p>
<hr/> <code>\IndentBox</code> <code>\g_para_indent_box</code> <hr/>	<p>The box register holding the indentation box for the paragraph is available for inspection (or changes) inside hooks. It remains available even if the <code>\OmitIndent</code> command was used; in that case it will just not be automatically placed.</p> <p>The <code>expl3</code> name for the box register is <code>\g_para_indent_box</code>.</p>
<hr/> <code>\RawIndent</code> <code>\para_raw_indent:</code> <code>\RawNoindent</code> <code>\para_raw_noindent:</code> <code>\RawParEnd</code> <code>\para_raw_end:</code> <hr/>	<p><code>\RawIndent</code>    <i>hmode material</i>   <code>\RawParEnd</code>  <code>\RawNoindent</code> <i>hmode material</i>   <code>\RawParEnd</code></p> <p>The commands <code>\RawIndent</code> and <code>\RawNoindent</code> are not meant for normal paragraph building (where the result is a textual paragraph in the traditional meaning of the word), but for special cases where <code>TeX</code>'s low-level algorithm is used to achieve special effects, but where the result is not a "paragraph".</p> <p>They are called "raw", because they bypass <code>L<sup>A</sup>TeX</code>'s hook mechanism for paragraphs and simply invoke the low-level <code>TeX</code> algorithm. I.e., they are like the original <code>TeX</code> primitives <code>\indent</code> and <code>\noindent</code> (that is they execute no hooks other than <code>\everypar</code>) except that they can only be used in vertical mode and generate an error if found elsewhere.</p> <p>To avoid issues a paragraph started by them should always be ended by <code>\RawParEnd</code><sup>21</sup> and not by <code>\par</code> (or a blank line), because the latter will execute hooks which then have no counterpart at the beginning of the paragraph. It is the responsibility of the programmer to make sure that they are properly paired. This also means that one should not put arbitrary user content between these commands if that content could contain stray <code>\pars</code>.</p> <p>The <code>expl3</code> names for the functions are <code>\para_raw_indent:</code>, <code>\para_raw_indent:</code> and <code>\para_raw_end:</code>.</p>

## 2.3 Examples

None of the examples in this section are meant for real use as they are far too simple-minded but they should give some ideas of what could be possible if a bit more care is applied.

### 2.3.1 Testing the mechanism

The idea is to output for each paragraph encountered some information: a paragraph sequence number, a level number in roman numerals, the environment in which this paragraph appears, and the line number where the start or end of the paragraph is, e.g., something like

```

PARA: 1-i start (document env. on input line 38)
PARA: 1-i end   (document env. on input line 38)
PARA: 2-i start (document env. on input line 40)
PARA: 3-ii start (minipage env. on input line 40)
```

```

    PARA: 3-ii end    (minipage env. on input line 40)
    PARA: 2-i end     (document env. on input line 41)

```

As you can see paragraph 2 starts on line 40 and ends on 41 and inside a minipage started paragraph 3 (start and end on line 40). If you run this on some document you will find that L<sup>A</sup>T<sub>E</sub>X considers more things “a paragraph” than you have probably thought.

This was generated by the following hook code:

```

\newcounter{paracnt}          % sequence counter
\newcounter{paralevel}        % level counter

```

To support paragraph nesting we need to maintain a stack of the sequence numbers. This is most easily done using expl3 functions, so we switch over. This is not a very general implementation, just enough for what we need and a bit of L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> thrown in as well. When popping, the result gets stored in `\paracntvalue` and the `\ERROR` should never happen because it means we have tried to pop from an empty stack.

```

\ExplSyntaxOn
\seq_new:N \g_para_seq
\cs_new:Npn \ParaPush
  {\seq_gpush:No \g_para_seq {\the\value{paracnt}}}
\cs_new:Npn \ParaPop  {\seq_gpop:NNF \g_para_seq \paracntvalue \ERROR }
\ExplSyntaxOff

```

At the start of the paragraph increment both sequence counter and level and also save the then current sequence number on our stack.

```

\AddToHook{para/begin}{%
  \stepcounter{paracnt}\stepcounter{paralevel}%
  \ParaPush
}

```

To display the sequence number we `\typeout` the current sequence and level number. The command `\@currenenvir` gives us the current environment and `\on@line` produces a space and the current input line number.

```

\typeout{PARA: \arabic{paracnt}-\roman{paralevel} start
  (\@currenenvir\space env.\on@line)}%

```

We also typeset the sequence number as a tiny red number in a box that takes up no horizontal space. This helps us seeing where L<sup>A</sup>T<sub>E</sub>X sees the start and end of the paragraphs in the document.

```

\llap{\color{red}\tiny\arabic{paracnt}\ }%
}

```

At the end of the paragraph we display sequence number and level again. The level counter has the correct value but we need to retrieve the right sequence value by popping it off the stack after which it is available in `\paracntvalue` the way we have set this up above.

```

\AddToHook{para/end}{%
  \ParaPop
  \typeout{PARA: \paracntvalue-\roman{paralevel} end \space\space
    (\@currenenvir\space env.\on@line)}%
}

```

We also typeset again a tiny red number with that value, this time sticking out to the right.<sup>22</sup> We also decrement the level counter since our level has finished.

```
\rlap{\color{red}\tiny\ \paracntvalue}%
\addtocounter{paralevel}{-1}%
}
\makeatother
```

### 2.3.2 Mark the first paragraph of each `itemize`

The code for this is rather simple. We supply some code that is executed only once inside a hook at the start of each `itemize`. We explicitly change the color back and forth so that we don't introduce grouping around the paragraph.

```
\AddToHook{env/itemize/begin}{%
\AddToHookNext{para/begin}{\color{blue}}%
\AddToHookNext{para/end}{\color{black}}%
}
```

As a result the first paragraph of each `itemize` will appear in blue.

## 2.4 Some technical notes

The code tries hard to be transparent for package code, but of course any change means that there is a potential for breaking other code. So in section we collect a few cases that may be of importance if low-level code is dealing with paragraphs that are now behaving slightly differently. The notes are from issues we observed and will probably grow over time.

### 2.4.1 Glue items between paragraphs (found with `fancypar`)

In the past  $\text{\LaTeX}$  placed two glue items between two consecutive paragraphs, e.g.,

```
text1 \par text2 \par
```

would show something like

```
\glue(\parskip) 0.0 plus 1.0
\glue(\baselineskip) 5.16669
```

but now there is another `\parskip` glue (that is always 0pt):

```
\glue(\parskip) 0.0 plus 1.0
\glue(\parskip) 0.0
\glue(\baselineskip) 5.16669
```

The reason is that we generate a “fake” paragraph to gain control and safely add the early hooks, but this generates an additional glue item. That item doesn't contribute anything vertically but if somebody writes code that unravels a constructed list using `\lastbox`, `\unskip` and `\unpenalty` then the code has to remove one additional glue item or else it will fail.

---

<sup>22</sup>Note that this can alter the document pagination, because a paragraph ending in a display (e.g., an equation) will get an extra line—in that case our tiny number has an effect even though it doesn't take up any space, because it paragraph is no longer empty and thus isn't dropped!

### 3 The Implementation

```

1 <@@=para>
2 <*2kernel | latexrelease>
3 \ExplSyntaxOn
4 <latexrelease> \NewModuleRelease{2021/06/01}{ltpara}
5 <latexrelease> {Paragraph~handling~and~hooks}

```

#### 3.1 Providing hooks for paragraphs

**para/before** The public hooks. They are implemented as a paired set of hooks.

```

para/after 6 \hook_new_pair:nn{para/before}{para/after}
para/begin 7 \hook_new_pair:nn{para/begin}{para/end}
para/end

```

(End definition for `para/before` and others. These functions are documented on page 297.)

**\@kernel@before@para@before** The corresponding kernel hooks (for tagging and future extensions).

```

\@kernel@after@para@after 8 \let \@kernel@before@para@before \@empty
\@kernel@before@para@begin 9 \let \@kernel@before@para@begin \@empty
\@kernel@after@para@end 10 \let \@kernel@after@para@end \@empty
11 \let \@kernel@after@para@after \@empty

```

(End definition for `\@kernel@before@para@before` and others. These functions are documented on page 298.)

`\g__para_standard_everypar_tl`

Whenever  $\text{\TeX}$  starts a paragraph it inserts first an indentation box and then executes the tokens stored in `\tex_everypar:D` (known to  $\text{\LaTeX}$  as `\everypar`). We alter this behavior slightly here, so that hooks are added into the right place. Otherwise the process change remains transparent to any legacy code for this space.

We keep the standard code to be used by `\tex_everypar:D` in a separate token list because we have to switch back and forth for error recovery and so altering `\tex_everypar:D` all the time should be a tiny bit faster.

```
12 \tl_new:N \g__para_standard_everypar_tl
```

Here is now its definition:

```
13 \tl_gset:Nn \g__para_standard_everypar_tl {
```

First we remove the indentation box and store it in `\g_para_indent_box`. If there was none because the paragraph was started by `\noindent` the box register will be void.

```
14 \box_gset_to_last:N \g_para_indent_box
```

This will make the newly started horizontal list empty, so if we stop it now and return to vertical mode it will be dropped by  $\text{\TeX}$ . We do that but inside a group so that any `\parshape` settings will not get lost as we need them for later.

```

15 \group_begin:
16 \tex_par:D
17 \group_end:

```

We then change `\tex_everypar:D` to generate an error so that we can detect and report if the `para/before` hook illegally changed out of vmode.

```

18 \tex_everypar:D { \msg_error:nnnn { hooks }{ para-mode }{before}{vertical} }
19 \@kernel@before@para@before
20 \hook_use:n {para/before}

```

Assuming the hooks have been well behaved it is time to return to horizontal mode and start the paragraph in earnest. We already have the indentation box saved away so we now have to restart the paragraph with an empty `\tex_everypar:D` and with `\tex_noindent:D`. And we need to make sure not to get another `\parskip` or rather (since we can't prevent that) that it is of zero size.

```

21 \group_begin:
22   \tex_everypar:D {}
23   \skip_zero:N \tex_parskip:D
24   \tex_noindent:D
25 \group_end:

```

That brings us back to the start of the horizontal list but we need to change `\tex_everypar:D` back to its normal content in case there are nested paragraphs coming up.

```

26 \tex_everypar:D{\g__para_standard_everypar_tl}

```

This is followed by executing the kernel and the public hook. The kernel hook is there to enable tagging.

```

27 \@kernel@before@para@begin
28 \hook_use:n {para/begin}

```

If we aren't in horizontal mode any longer the hooks above misbehaved.

```

29 \if_mode_horizontal: \else:
30   \msg_error:nnnn { hooks }{ para-mode }{begin}{vertical} \fi:

```

Finally we reinsert the indentation box (unless suppressed) and then call `\everypar` the way legacy L<sup>A</sup>T<sub>E</sub>X code expects it.

However, adding the public `\everypar` is a bit tricky (see below) so we add that later, and indirectly.

```

31 \__para_handle_indent:
32 % \the \everypar          % <--- done differently below
33 }

```

(End definition for `\g__para_standard_everypar_tl`.)

`\tex_everypar:D` `\tex_everypar:D` then only has to execute `\g__para_standard_everypar_tl` by default.

```

34 \tex_everypar:D{\g__para_standard_everypar_tl}

```

(End definition for `\tex_everypar:D`.)

`\everypar` Tokens inserted at the beginning of the paragraph are placed into `\everypar` inside legacy L<sup>A</sup>T<sub>E</sub>X code, e.g., by the list environments or by headings to handle `\clubpenalty`, etc. Now this isn't any longer the primitive but simply a toks register used in the code above but to legacy L<sup>A</sup>T<sub>E</sub>X code that is transparent.

There is, however, a problem: a handful packages use exactly the same trick and replace the primitive with a token register and call the token register inside the renamed primitive. That is they assume that `\everypar` is the primitive and that it will still be called at the start of the paragraph even if renamed.

But if we have already replaced it by a token register then all they do is to give that token register a new name. Thus our code in `\tex_everypar:D` would call `\everypar` (which is now their token register) and the code that they added ends up in our token register which is then never used at all. A bit mind boggling I guess.

So what we have to do is not to call the token register `\everypar` by its name inside `\tex_everypar:D` but by using its actual register number.

```

35 \newtoks \everypar

```

After we have allocated a new toks register with the name `\everypar` the actual register number is available (briefly) inside `\allocationnumber`. So instead of `\the\everypar` we have to put `\the\toks<allocated number>` at the end of `\tex_everypar:D`.

So what remains doing is to append a few tokens to the token list `\g__para_standard_everypar_tl` which we do now. We use x expansion here to get the value of `\allocationnumber` in, all the other tokens should not be expanded at this point.

One important point here is to terminate the register allocation number with a real space. This space will get swallowed up when the number is read. Anything else, such as `\scan_stop:` would remain in the input and that would mean that it would interfere with `\everypar` code that attempts to scan ahead to see how the paragraph text starts.

```

36 \tl_gput_right:Nx \g__para_standard_everypar_tl {
37   \exp_not:N \the
38   \exp_not:N \toks
39   \the \allocationnumber
40   \c_space_tl
41 }

```

(End definition for `\everypar`.)

**`\g_para_indent_box`** For managing the indentation we need to provide a public accessible box register

```

42 \box_new:N \g_para_indent_box

```

(End definition for `\g_para_indent_box`. This function is documented on page 299.)

**`\__para_handle_indent:`** Adding (typesetting) the indent box is straight forward. If it was emptied before it does nothing.

```

43 \cs_new:Npn \__para_handle_indent: {
44   \box_use_drop:N \g_para_indent_box
45 }

```

The declaration `\para_omit_indent:` (or `\OmitIndent`) changes that to do nothing.

```

46 \cs_new:Npn \para_omit_indent: {
47   \box_gclear:N \g_para_indent_box
48 }

```

(End definition for `\__para_handle_indent:`.)

**`\IndentBox`** The L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> names for the indentation box and for suppressing it for use in the `para/begin` hook.

```

49 \cs_set_eq:NN \IndentBox \g_para_indent_box
50 \cs_set_eq:NN \OmitIndent \para_omit_indent:

```

(End definition for `\IndentBox` and `\OmitIndent`. These functions are documented on page 299.)

**`\para_end:`** Adding hooks to the end of a paragraph is similar but here we need to alter the command that is used by T<sub>E</sub>X to end horizontal mode and return to vertical mode, i.e., `\par`.

This is a bit more complicated as this command can appear anywhere either explicitly or implicitly added by T<sub>E</sub>X in certain situations:

- when using `\par` in the code or the document
- when using a blank line (which is converted to `\par`)
- when T<sub>E</sub>X finds any commands incompatible with horizontal mode it issues a `\par` and then rereads the command.



Unfortunately, T<sub>E</sub>X has some (these days) unnecessary optimizations: if a `\vbox` ends and T<sub>E</sub>X is still in horizontal mode it simply exercises the paragraph builder instead of issuing a `\par`. It is therefore necessary for L<sup>A</sup>T<sub>E</sub>X to ensure that this case doesn't happen and all boxes internally have a `\par` command at their end.

This `\par` may or may not run the “par primitive” (which is always available as `\tex_par:D` in `expl3`); it is permissible to have a changed meaning and it is in fact changed by L<sup>A</sup>T<sub>E</sub>X in various ways at various points inside `latex.ltx`. For this L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> code has the following conventions: `\@@par` and `\endgraf` both refer to the default meaning (in the past this was the `initex` primitive) while `\par` is the current meaning which maybe does something else.

We are now going to change this default meaning to instead run `\para_end:`, which ultimately executes the `initex` primitive but additionally adds our hooks when appropriate. This way the change is again transparent to the legacy L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> code.

In most cases `\para_end:` should behave exactly like the primitive and we achieve this by simply expanding it to the primitive which is available to us as `\tex_par:D`. This way we don't have to care about whether T<sub>E</sub>X just does nothing (e.g., if in vertical mode already) or generates an error, etc.

```
51 \cs_new_protected:Npn \para_end: {
```

CCC Maybe needs more explanation. TEMP NOTE: What should happen if in outer hmode with an empty hlist?

The only case we care about is when we are in horizontal mode (i.e., doing typesetting) and not also in inner mode (i.e., making paragraphs and not building an `\hbox`).

```
\bool_lazy_and:nnT
{ \mode_if_horizontal_p: }
{ \bool_not_p:n { \mode_if_inner_p: } }
{ ...
```

Since this is executed for each and every paragraph in a document we try to stay as fast as possible, so we do not use the above construct but two conditionals instead. Using low-level `\if_mode...` conditions would be even faster but has the danger to conflict with conditionals in the user hooks.

If `\para_end:` is executed while T<sub>E</sub>X is currently doing a low-level assignment the test for horizontal mode may get executed as part of the assignment. That is normally not an issue but we just found one case where it is:

```
\afterassignment\lst@vskip\@tempskipa \z@ \par
```

If T<sub>E</sub>X is in hmode while that assignment happens then the `\par` is seen in hmode because in the above case the assignment may not be finished (one should have used `\z@skip`) and the `\lst@vskip` will get inserted into the middle of the conditional. The `\lst@vskip` then changes to vmode and you get a surprising error about the `para/end` hook having changed modes even if you don't have any hook code(!): it is the inserted `\lst@vskip` that is actually causing the change of mode. This is what happened when the output routines got started while a `lstlisting` environment (that redefines `\vskip` in this way) was active. This is really faulty coding, but we try to be proactive and guard the conditional so that any scanning is first stopped, thus:

```
52 \scan_stop:
53 \mode_if_horizontal:TF {
54 \mode_if_inner:F {
```

In that case the action of the primitive would be to remove the last glue (but no kerns) from the horizontal list (constructed to form a paragraph) and then to append a penalty of 10000 and the `\parfillskip`; it then passes the whole list to the paragraph builder, which breaks it into lines and  $\TeX$  then returns to vertical mode.

What we want to do is to add this hook code at the end of the horizontal list before any of the above happens. If there was a glue item at the end of the list then it should get removed before the hook code gets added so we have to arrange for this removal.

As in other similar cases, it maybe best to add here a `\nobreak` in case the hook itself adds glue and thus creates a non-explicit and unwanted potential breakpoo<sup>nt</sup>. On the other hand (as has been argued) the code in the hook should perhaps have the responsibility for adding such a guard penalty in this casse. This needs further analysis and decisions (as in emails).

In either case, good documentation of these hooks is essential, covering what the hook may or should provide and all such related considerations concerning the content.

There is not much point in checking if there was really a glue item at the end of the horizontal list, instead we simply try to remove one using `\tex_unskip:D`: if there wasn't one this will do nothing.

```
55         \tex_unskip:D
```

We then execute the public hook (which may add some final typeset material) followed by the kernel hook that we need for adding tagging support. None of this is supposed to change the mode—at the moment we make only a very simple test for this, more devious changes go unnoticed, but too bad as they will then probably backfire badly.

```
56         \hook_use:n{para/end}
57         \@kernel@after@para@end
58         \mode_if_horizontal:TF {
```

The final action (before getting to the point where `\tex_par:D` is called) is to add an extra glue item so that the primitive is prevented from removing intended glue (if there was some). If we don't do this and the horizontal list ends in several glue items we would end up removing two glue items instead of just the last one, which would be wrong. We use glue (rather than a kern) as that will be removed by the primitive.

There is however one other  $\TeX$  optimization that hurts: in a sequence like this `$$ ... $$ \par` (with `\par` being the primitive)  $\TeX$  will be in horizontal mode after the display, ready to receive further paragraph text, but since the `\par` follows immediately there is a “null” paragraph at the end and  $\TeX$  simply throws that away. The space between `$$` and `\par` got already dropped during the display processing so the `\par` is not removing any space and appending `\parfillskip`, instead it simply goes silently to vmode.

Now if we would have added something (to prevent glue removal) that would look to  $\TeX$  like material after the display and so we would end up with an empty paragraph just containing a penalty and `\parfillskip`.

We therefore check if the current hlist does end in glue (`\tex_lastnodetype:D` has the value 11) and if so we add a zero-length guard skip which will be removed by the following `\tex_par:D`.

```
59         \if_int_compare:w 11 = \tex_lastnodetype:D
60         \tex_hskip:D \c_zero_dim
61         \fi:
```

To run the `para/after` hook we first end the paragraph. This means that the `\tex_par:D` at the very end is unnecessary but executing it there unnecessarily is better than having code that tests for all the different mode possibilities.

```

62         \tex_par:D
63         \hook_use:n{para/after}
64         \@kernel@after@para@after
65     }

```

If we were not horizontal mode (the F case from above) then the earlier hook `para/end` must have been at fault, so we report that.

```

66     { \msg_error:nnnn { hooks }{ para-mode }{end}{horizontal} }

```

Finally close out the nested conditionals.

```

67     }
68 }

```

And then we can use the primitive to truly end the paragraph.

```

69 \tex_par:D
70 }

```

*(End definition for `\para_end:`. This function is documented on page 298.)*

`\para_raw_indent:` The commands `\para_raw_indent:` and `\para_raw_noindent:` are like the primitives `\indent` and `\noindent` except that they can only be used in vertical mode.

To avoid issues a paragraph started by them should always be ended by `\para_raw_end:` and not by `\para_end:` or `\par` as the latter will execute hooks which then have no counterpart at the beginning of the paragraph. It is the responsibility of the programmer to make sure that they are properly paired.

```

71 \cs_new:Npn \para_raw_indent: {
72   \mode_if_vertical:TF
73   {
74     \tex_everypar:D {
75       \box_gset_to_last:N \g_para_indent_box
76       \tex_everypar:D { \g__para_standard_everypar_tl }
77       \__para_handle_indent:
78       \the\everypar }
79   }
80   { \msg_error:nn { latex2e }{ raw-para } }
81   \tex_indent:D
82 }

83 \cs_new:Npn \para_raw_noindent: {
84   \mode_if_vertical:TF
85   {
86     \tex_everypar:D {
87       \tex_everypar:D { \g__para_standard_everypar_tl }
88       \the\everypar }
89   }
90   { \msg_error:nn { latex2e }{ raw-para } }
91   \tex_noindent:D
92 }

93 \cs_new_eq:NN \para_raw_end: \tex_par:D

```

*(End definition for `\para_raw_indent:`, `\para_raw_noindent:`, and `\para_raw_end:`. These functions are documented on page 299.)*

**\RawIndent** The L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> names for starting and ending a paragraph without adding any hooks.

**\RawNoIndent** 94 \cs\_set\_eq:NN \RawIndent \para\_raw\_indent:

**\RawParEnd** 95 \cs\_set\_eq:NN \RawNoindent \para\_raw\_noindent:

96 \cs\_set\_eq:NN \RawParEnd \para\_raw\_end:

(End definition for \RawIndent, \RawNoIndent, and \RawParEnd. These functions are documented on page 299.)

This ends the para module code.

97 <@@=>

**\par** Having the new default definition for \par we also have to set it up so that it gets used.

**\endgraf** This involves three commands: \par, \@@par (to which L<sup>A</sup>T<sub>E</sub>X resets \par occasionally)

**\@@par** and \endgraf, which is another name for the “default” action of \par.

98 \cs\_set\_eq:NN \par \para\_end:

99 \cs\_set\_eq:NN \@@par \para\_end:

100 \cs\_set\_eq:NN \endgraf \para\_end:

(End definition for \par, \endgraf, and \@@par. These functions are documented on page 298.)

While this is not integrated properly into the format we have to redo the \everypar setting from the kernel, otherwise that gets lost (as it happens before that file is loaded).

101 \everypar{\@nodocument} %% To get an error if text appears before the

### 3.2 The error messages

This one is used when we detect that some hook code has changed the mode where it shouldn't, e.g., by starting or ending a paragraph. The first argument is the hook name second the mode it should have stayed in but didn't.

```

102 \msg_new:nnnn { hooks } { para-mode }
103 {
104   Illegal-mode~ change~ in~ hook~ 'para/#1'.\\
105   Hook~ code~ did~ not~ remain~ in~ #2~ mode.
106 }
107 {
108   Paragraph~ hooks~ cannot~ change~ the~ TeX~ mode~ without~ causing~
109   endless~ recursion.~ The~ hook~ code~ in~ 'para/#1'~ needs~ to~ stay~
110   in~ #2~ mode,~ but~ it~ didn't.~ Examine~ the~ hook~
111   code~ with~ \iow_char:N \ShowHook~ to~ find~ the~ issue.
112 }

```

And here is one used in the “raw” commands when they are used outside of vertical mode.

```

113 \msg_new:nnnn { latex2e } { raw-para }
114 {
115   Not~ in~ vertical~ mode.
116 }
117 {
118   Starting~ a~ paragraph~ with~ \iow_char:N \RawIndent~ or~
119   \iow_char:N \RawNoindent \\
120   (or~ \iow_char:N \para_raw_indent:~ or~
121   \iow_char:N \para_raw_noindent:)~ is~ only~ allowed \\
122   if~ LaTeX~ is~ in~ vertical~ mode.
123 }

```

```

124 %
125 <latexrelease>\IncludeInRelease{0000/00/00}%
126 <latexrelease>{ltpara}{Undo~hooks~for~paragraphs}
127 <latexrelease>
128 <latexrelease>\let \OmitIndent \@undefined
129 <latexrelease>\let \IndentBox \@undefined
130 <latexrelease>\let \RawIndent \@undefined
131 <latexrelease>\let \RawNoindent \@undefined
132 <latexrelease>\let \RawParEnd \@undefined
133 <latexrelease>
134 <latexrelease>\cs_set_eq:NN \par \tex_par:D
135 <latexrelease>\cs_set_eq:NN \@@par \tex_par:D
136 <latexrelease>\cs_set_eq:NN \endgraf \tex_par:D
137 <latexrelease>

```

We also need to clean up the primitive “everypar” as that should no longer execute any code by default. And, of course, make \everypar become the primitive again.

```

138 <latexrelease>\tex_everypar:D {}
139 <latexrelease>\cs_set_eq:NN \everypar \tex_everypar:D
140 <latexrelease>
141 <latexrelease>\EndModuleRelease
142 \ExplSyntaxOff
143 </2ekernel | latexrelease>

```

# File o

# ltmeta.dtx

## Abstract

This code defines the `\DocumentMetadata` interface.

## 1 Introduction

In the past there was no dedicated location to declare settings concerning a document as a whole. Settings are placed somewhere in the preamble or with the class options or even with some package options. For some settings this can be too late, for example the pdf version can no longer be changed if a package has used code which already opened the PDF.

`\DocumentMetadata` as a new command unifies such settings in one place. It must be used before `\documentclass` but can be issued more than once there.

At the moment most of the code run by `\DocumentMetadata` is external to the format and subject to change. This includes the supported key/values.

For that reason all that happens right now in the format is to look for suitable support files and if found, to redirect the processing to them.

### 1.1 `\DocumentMetadata`

---

<code>\DocumentMetadata</code>	<code>\DocumentMetadata{&lt;key-value list&gt;}</code>
--------------------------------	--

---

The keys defined for `\DocumentMetadata` currently allow to set the PDF version, to set the PDF `/Lang`, to uncompress a PDF, to set the language and to declare a few PDF standards and some color profiles.

`\DocumentMetadata` is also used to activate the new PDF management code and it loads a number of required files for the PDF management code. As this forces the loading of the backend files, a backend which can't be detected automatically like `dvipdfmx`, must be set in the first `\DocumentMetadata` call (if there is more than one).

The full set of keys currently supported is documented in `documentmetadata-support.pdf` for now.

## 2 The Implementation

```
1 <*2ekernel | latexrelease>
Not needed yet but ...
2 %\ExplSyntaxOn
3 <latexrelease> \NewModuleRelease{2022/06/01}{ltmeta}
4 <latexrelease> {Document Metadata handling}
5 \let \IfDocumentMetadataTF \@secondoftwo
6 \protected\def\DocumentMetadata{%
7   \InputIfFileExists{documentmetadata-support.ltx}%
8   {}%
```

The above file is changing `\DocumentMetadata` to a suitable definition (or so we hope), so that we can try again — if not tough.

If the file can't be found we say so and carry on without it.

```

9      {%
10      \latex@error{No support files for
11              \noexpand\DocumentMetadata found}
12      {Is the 'LaTeX-lab' bundle installed?%
13      \MessageBreak
14      Without it, the declaration is ignored.}%

```

No point in trying this more than once if there are several calls in the document.

```

15      \let\DocumentMetadata\@gobble
16      }%
17      \let \IfDocumentMetadataTF \@firstoftwo
18      \DocumentMetadata
19  }

```

To allow package and class author to support for document links we provide also the new interface commands of the `hyperref` package for the creation of targets.

```

\MakeLinkTarget
\LinkTargetOn 20 \NewDocumentCommand\MakeLinkTarget{s0}{m}{%
\LinkTargetOff 21 \ifvmode
\NextLinkTarget 22 \special{}%
23 \else
24 \savesf\spacefactor
25 \smash{}%
26 \spacefactor\@savs
27 \fi}
28 \NewDocumentCommand\LinkTargetOn{}{}
29 \NewDocumentCommand\LinkTargetOff{}{}
30 \NewDocumentCommand\NextLinkTarget{m}{}

```

(End definition for `\MakeLinkTarget` and others.)

We do not undo `\MakeLinkTarget` and friends if we roll back, in case they are used in packages that themselves do not offer rollback. This way a roll forward adds them, but the dummies remain if you roll back and you don't get missing csname errors if they are used.

```

31 \latexrelease\IncludeInRelease{0000/00/00}{ltmeta}%
32 \latexrelease\Undo Document Metadata handling}
33 \latexrelease
34 \latexrelease\let\DocumentMetadata\@undefined
35 \latexrelease
36 \latexrelease\EndModuleRelease

```

Again for the future ...

```

37 %\ExplSyntaxOff
38 \</2ekernel | latexrelease>
39 \<@@=

```

Restore module prefix (if any):

# File p

## ltspace.dtx

### 1 Spacing

This section deals with spacing, and line- and page-breaking.

#### 1.1 User Commands

`\nopagebreak` [ $\langle i \rangle$ ] :  $\langle i \rangle = 0, \dots, 4$ .  
Default argument = 4. Puts a penalty into the vertical list output as follows:  
0 : penalty = 0  
1 : penalty = `\@lowpenalty`  
2 : penalty = `\@medpenalty`  
3 : penalty = `\@highpenalty`  
4 : penalty = 10000  
`\pagebreak` [ $\langle i \rangle$ ] : same as except negatives of its penalty  
`\linebreak` [ $\langle i \rangle$ ] : analog of the above  
`\nolinebreak` [ $\langle i \rangle$ ] : analog of the above  
`\samepage` : inhibits page breaking most places by setting the following penalties to 10000:  
`\interlinepenalty`  
`\postdisplaypenalty`  
`\interdisplaylinepenalty`  
`\@beginparpenalty`  
`\@endparpenalty`  
`\@itempenalty`  
`\@secpenalty`  
`\interfootnotelinepenalty`  
`\\` : initially defined to be `\newline`  
`\\[ $\langle length \rangle$ ]` : initially defined to be `\vspace{ $\langle length \rangle$ }\newline`  
Note: `\\*` adds a `\adjust{\penalty 10000}`  
OBSOLETE COMMANDS (which never made it into the manual):  
`\obeycr` : defines `<CR> == \\relax`  
`\restorecr` : restores `<CR>` to its usual meaning.

#### 1.2 Chris' comments

There are several aspects of the handling of space in horizontal mode that are inconsistent or do not work well in some cases. These are largely concerned with ignoring the effect of space tokens that would otherwise typeset an inter-word space.

Negating the effect of such space tokens is achieved by two mechanisms:

- `\unskip` is used to remove the glue just added by a space that has already had its effect; it is sometimes invoked after an `\ifdim` test on `\lastskip` (see below);
- `\ignorespaces` is used to ignore space-tokens yet to come.



The test done on `\lastskip` is sometimes for equality with zero and sometimes for being positive. Recall also that the test is only on the natural length of the glue and that no glue cannot be distinguished from glue whose natural length is zero: to summarise, a pretty awful test. It is not clear why these tests are not all the same; I think that they should all be for equality. One place where `\unskip` is often used is just before a `\par` (which itself internally does an `\unskip`) and one bit of code (in `\@item`) even has two `\unskips` before a `\par`. These uses may be fossil code but if they are necessary, maybe `\@killglue` would be even safer.

Such removal of glue by `\unskip` may sometimes have the wrong result, removing not the glue from a space-token but other explicit glue; this is sometimes not what is intended.

A common way to prevent such removal is to add an `\hskip\z@` after the glue that should not be removed. This protects that glue against one `\unskip` with no test but not against more than one. It does work for ‘tested `\unskips`’. This is used by `\hspace*` but not by `\hspace`; this is inconsistent as the star is supposed to prevent removal only at the beginning of a line, not at the end, or in a tabular, etc.

If this reason for removing glue were the only consideration then a tested-`\unskip` and protection by `\hskip\z@` would suffice but would need to be consistently implemented.

However, the class of invisibles, commands and environments tries to be even cleverer: one of these tries to leave only one inter-word space whenever there is one before it and one after it; and it does this quite well.

But problems can arise when there is not a space-token on both sides of it; in particular, when an invisible appears at the beginning or end of a piece of text the method still leaves one space token whereas usually in these cases it should leave none.

Also, the current rules do not work well when more than one such command appears consecutively, separated by space-tokens; it leaves glue between every other invisible.

There is also a question about what these commands should do when they occur next to spaces that do not come from space tokens but, for example, from `\hspace`. Should they still produce ‘just one space’? If so, which one? It is good to note that the manual is sufficiently cautious about invisibles that we are not obliged to make anything work.

Another interesting side-road to explore is whether the space-tokens either side of an `\hspace{...}` should be ignored.

One alternative to the current algorithm that is often suggested is that all glue around the invisible should be consolidated into a space after it (usually without stating how much glue should be put there). The command `\nolinebreak` is implemented this way (and `\linebreak` should also be). This does not work correctly for the following common case:

```
... some text
\index{some-word}
some-word and more text.
```

This is optimal coding since it is normal to index a word that gets split across a page-break on its starting page. This would, on the other hand, fix another common (and documented) failure of the current system: when the invisible is the last thing in a paragraph the space before it is not removed and, worse, it is also hidden from the paragraph-ending mechanism so that an ‘empty’ line can be created at the end of the paragraph.

Another deficiency (I think) of the current system is that the following is treated as having the `\index` command between the paragraphs, which is probably not what the author intended (since there is no empty line after it).

```
\index{beginnings}
Beginnings of paragraphs ...
```

I know of no algorithm that will handle satisfactorily even all the most common cases; note that it could be that the best algorithm may be different for different invisibles since, for example, the common uses and expected behaviour of `\index`, `\marginpar`, `\linebreak`, `\pagebreak` and `\vspace` are somewhat different. [For example, is `\vspace` ever used in the middle of a paragraph?]

One method that can (and is) used to make invisible commands produce no space when used at the beginning of text is to put in some glue that is nearly enough the same as no glue or glue of zero length in all respects except for the precise test for not being exactly equal to zero; examples of such glue are `\hskip 1sp` and, possibly better but more complex, `\hskip -1sp \hskip 1sp`. However, this only works when it is known that user-supplied text is about to start.

Some similar concerns apply to the handling of space and penalties in vertical mode; there is an extra hurdle here as `\unskip` does not work on the main vertical list. The complexity of the tests done by `\addvspace` have never been explained.

The implementation of space hacks etc for vertical mode is another major area that needs further attention; my earlier experiments did not produce much improvement over the current unsatisfactory situation.

One particular problem is what happens when the following very natural coding is used (part of the problem here is that this looks like an hmode problem, but it is not):

```
... end of text.

\begin{enumerate}
  \item \label{item:xxx} Item text.
\end{enumerate}
```

### 1.3 Some immediate actions

- Fix bug in `\linebreak`.
- Fix bug in `\\*`.
- Reimplement `\\`, etc, removing extra `\vadjusts` and getting better error trapping (this seems to involve a lot more tokens).
- Investigate whether `\\`, etc need to be errors in vmode; I think that they could be noops (maybe with a warning).
- Make all(?) `\unskips` include test for zero skip (rather than other tests or no test).
- Consider replacing `\hskip 1sp` by something better (here called an ‘infinitesimal’ skip).
- Look at all `\hskip\z@` (or similar) to see if they should be changed to an ‘infinitesimal’ skip.

- Resolve the inconsistency between `\hspace` and `\hspace*`.
- Remove unnecessary `\unskips`.
- Investigate and rationalise the ‘newline’ code.
- Find better algorithms for all sorts of things or, easier(?), fix T<sub>E</sub>X itself.

## 1.4 The code

```

1  <*2ekernel>
2  \message{spacing,}
3  </2ekernel>
4  <*2ekernel | latexrelease>
5  <latexrelease>\IncludeInRelease{2019/10/01}%
6  <latexrelease>                {\pagebreak}{Make commands robust}%

\pagebreak
\nopagebreak
7  \DeclareRobustCommand\pagebreak{\@testopt{\@no@pgbk-}4}
8  \DeclareRobustCommand\nopagebreak{\@testopt{\@no@pgbk4}

(End definition for \pagebreak and \nopagebreak.)

\linebreak
\nolinebreak
9  \DeclareRobustCommand\linebreak{\@testopt{\@no@lnbk-}4}
10 \DeclareRobustCommand\nolinebreak{\@testopt{\@no@lnbk4}

(End definition for \linebreak and \nolinebreak.)

\samepage
11 \DeclareRobustCommand\samepage{\interlinepenalty\@M
12   \postdisplaypenalty\@M
13   \interdisplaylinepenalty\@M
14   \@beginparpenalty\@M
15   \@endparpenalty\@M
16   \@itempenalty\@M
17   \@secpenalty\@M
18   \interfootnotelinepenalty\@M}

(End definition for \samepage.)

19 </2ekernel | latexrelease>
20 <latexrelease>\EndIncludeInRelease
21 <latexrelease>\IncludeInRelease{0000/00/00}%
22 <latexrelease>                {\pagebreak}{Make commands robust}%
23 <latexrelease>
24 <latexrelease>\kernel@make@fragile\pagebreak
25 <latexrelease>\kernel@make@fragile\nopagebreak
26 <latexrelease>\kernel@make@fragile\linebreak
27 <latexrelease>\kernel@make@fragile\nolinebreak
28 <latexrelease>\kernel@make@fragile\samepage
29 <latexrelease>
30 <latexrelease>\EndIncludeInRelease
31 <*2ekernel>

```

`\@no@pgbk`

```
32 \def\@no@pgbk #1[#2]{%
33   \ifvmode
34     \penalty #1\@getpen{#2}%
35   \else
36     \@bsphack
37     \vadjust{\penalty #1\@getpen{#2}}%
38     \@esphack
39   \fi}
```

*(End definition for \@no@pgbk.)*

`\@no@lnbk`

```
40 \def\@no@lnbk #1[#2]{%
41   \ifvmode
42     \@nolnerr
43   \else
44     \@tempskipa\lastskip
45     \unskip
46     \penalty #1\@getpen{#2}%
47     \ifdim\@tempskipa>\z@
48       \hskip\@tempskipa
49       \ignorespaces
50     \fi
51   \fi}
```

*(End definition for \@no@lnbk.)*

`\@` The purpose of the new code is to fix a few bugs; however, it also attempts to optimize the following, in order of priority:

1. efficient execution of plain `\@`;
2. efficient execution of `\@[...]`;
3. memory use;
4. name-space use.

The changes should make no difference to the typeset output. It appears to be safe to use `\reserved@e` and `\reserved@f` here (other reserved macros are somewhat disastrous).

These changes made `\newline` even less robust than it had been, so now it is explicitly robust, like `\@`.

The internal definition of the ‘normal’ definition of `\@`.

`\@normalcr`

```
52 </2ekernel>
53 <*2ekernel | latexrelease>
54 <latexrelease> \IncludeInRelease{2020/02/02}%
55 <latexrelease>           {\@normalcr}{Make robust}%
56 \protected\def\@normalcr{%
57   \let \reserved@e \relax
58   \let \reserved@f \relax
59   \@ifstar{\let \reserved@e \vadjust \let \reserved@f \nobreak
60             \@xnewline}%
61   \@xnewline}
```

```

62 \let\\\@normalcr
63 </2ekernel | latexrelease>
64 <latexrelease>\EndIncludeInRelease
65 <latexrelease>\IncludeInRelease{0000/00/00}%
66 <latexrelease>          {\@normalcr}{Make robust}%
67 <latexrelease>
68 <latexrelease>\DeclareRobustCommand\\\{
69 <latexrelease>  \let \reserved@e \relax
70 <latexrelease>  \let \reserved@f \relax
71 <latexrelease>  \@ifstar{\let \reserved@e \vadjust \let \reserved@f \nobreak
72 <latexrelease>          \@xnewline}%
73 <latexrelease>  \@xnewline}
74 <latexrelease>\expandafter\let\expandafter\@normalcr
75 <latexrelease>  \csname\expandafter\@gobble\string\\\ \endcsname
76 <latexrelease>
77 <latexrelease>\EndIncludeInRelease
78 <*2ekernel>

```

(End definition for \ and \@normalcr.)

**\@vspace@calcify** Helper command to produce a \vskip that is first run through \setlength. This way the calc package can operate on the argument value.

```

79 </2ekernel>
80 <*2ekernel | latexrelease>
81 <latexrelease>\IncludeInRelease{2020/10/01}%
82 <latexrelease>          {\@vspace@calcify}{Add calc support}%
83 \def\@vspace@calcify#1{\begingroup\setlength\skip@{#1}\vskip\skip@\endgroup}
84 </2ekernel | latexrelease>
85 <latexrelease>\EndIncludeInRelease
86 <latexrelease>\IncludeInRelease{0000/00/00}%
87 <latexrelease>          {\@vspace@calcify}{Add calc support}%
88 <latexrelease>
89 <latexrelease>\let\@vspace@calcify\@undefined
90 <latexrelease>\EndIncludeInRelease
91 <*2ekernel>

```

(End definition for \@vspace@calcify.)

**\newline** A simple form of the ‘normal’ definition of \.

```

92 \DeclareRobustCommand\newline{\@normalcr\relax}

```

(End definition for \newline.)

**\@xnewline**

```

93 \def\@xnewline{\@ifnextchar[% ] bracket matching
94          \@newline
95          {\@gnewline\relax}}

```

(End definition for \@xnewline.)

**\@newline**

```

96 </2ekernel>
97 <*2ekernel | latexrelease>
98 <latexrelease>\IncludeInRelease{2020/10/01}%

```

```

99 <latexrelease>                                {\@newline}{\newline calc support}%
100 \def\@newline[#1]{\let \reserved@e \vadjust
101                               \@gnewline {\@vspace@calcify{#1}}}
102 </2ekernel | latexrelease>
103 <latexrelease>\EndIncludeInRelease

104 <latexrelease>\IncludeInRelease{0000/00/00}%
105 <latexrelease>                                {\@newline}{\newline calc support}%
106 <latexrelease>
107 <latexrelease>\def\@newline[#1]{\let \reserved@e \vadjust
108 <latexrelease>                                \@gnewline {\vskip #1}}
109 <latexrelease>\EndIncludeInRelease
110 <*2ekernel>

```

(End definition for \@newline.)

**\@gnewline** The \nobreak added to prevent null lines when \\ ends an overfull line. Change made 24 May 89 as suggested by Frank Mittelbach and Rainer Schöpf

```

111 \def\@gnewline #1{%
112     \ifvmode
113         \@nolnerr
114     \else
115         \unskip \reserved@e {\reserved@f#1}\nobreak \hfil \break
116     \fi}

```

(End definition for \@gnewline.)

**\@getpen**

```

117 \def\@getpen#1{\ifcase #1 \z@ \or \@lowpenalty\or
118                 \@medpenalty \or \@highpenalty
119                 \else \@M \fi}

```

(End definition for \@getpen.)

**\if@nobreak** Switch used to avoid page breaks caused by \label after a section heading, etc. It should be **GLOBALLY** set true after the \nobreak and **globally** set false by the next invocation of \everypar.

Commands that reset \everypar should globally set it false if appropriate.

```

120 \def\@nobreakfalse{\global\let\if@nobreak\iffalse}
121 \def\@nobreaktrue {\global\let\if@nobreak\iftrue}
122 \@nobreakfalse

```

(End definition for \if@nobreak.)

**\@savsk** Registers used to save the space factor and last skip.

```

123 \newdimen\@savsk
124 \newcount\@savsf

```

(End definition for \@savsk and \@savsf.)

`\@bsphack` `\@bsphack` and `\@esphack` used by macros such as `\index` and `\begin{@float} ... \end{@float}` that want to be invisible — i.e., not leave any extra space when used in the middle of text. Such a macro should begin with `\@bsphack` and end with `\@esphack`. The macro in question should not create any text, nor change the mode.

Before giving the current definition we give an extended definition that is currently not used (because it doesn't work as advertised:-)

These are generalised hacks which attempt to do sensible things when 'invisible commands' appear in vmode too.

They need to cope with space in both hmode (plus spacefactor) and vmode, and also cope with breaks etc. In vmode this means ensuring that any following `\advspace`, etc sees the correct glue in `\lastskip`.

In fact, these improved versions should be used for other cases of 'whatsits, thingies etc' which should be invisible. They are only for commands, not environments (see notes on `\@Esphack`).

BTW, anyone know why the standard hacks are surrounded by `\ifmmode\else` rather than simply `\ifhmode`?

And are there any cases where saving the spacefactor is essential? I have some extensions where it is, but it does not appear to be so in the standard uses.

```
def \@bsphack{%
  \relax \ifvmode
    \@savsk \lastskip
    \ifdim \lastskip=\z@
    \else
      \vskip -\lastskip
    \fi
  \else
    \ifhmode
      \@savsk \lastskip
      \@savsf \spacefactor
    \fi
  \fi
}
```

I think that, in vmode, it is the safest to put in a `\nobreak` immediately after such things since writes, inserts etc followed by glue give valid breakpoints and, in general, it is possible to create breaks but impossible to destroy them.

```
def \@esphack{%
  \relax \ifvmode
    \nobreak
    \ifdim \@savsk=\z@
    \else
      \vskip \@savsk
    \fi
  \else
    \ifhmode
      \spacefactor \@savsf
      \ifdim \@savsk>\z@
        \ignorespaces
      \fi
    \fi
  \fi
}
```

```

\fi
\fi

```

For the moment we are going to ignore the vertical versions until they are correct.

```

125 \def\bsphack{%
126   \relax
127   \ifhmode
128     \savsk\lastskip
129     \savsf\spacefactor
130   \fi}

```

(End definition for \bsphack.)

**\@esphack** Companion to \bsphack. If this command is not properly paired with \bsphack one might end up with a low-level T<sub>E</sub>X error: “BAD spacefactor”. One possible cause is calling \bsphack in vertical mode, then doing something that gets you (sometimes) into horizontal mode and finally calling \@esphack. Even if no error is generated that is wrong, because \@esphack will then use the saved values for \savsk and \savsf from some earlier invocation of \bsphack which will have nothing to do with the current situation.

```

131 </2kernel>
132 <latexrelease>\IncludeInRelease{2018/10/10}%
133 <latexrelease>          {\@esphack}{hyphenation and nobreak after space hack}%
134 <*2kernel | latexrelease>
135 \def\@esphack{%
136   \relax
137   \ifhmode
138     \spacefactor\@savsf
139     \ifdim\@savsk>\z@
140       \ifdim\lastskip=\z@
141         \nobreak \hskip\z@skip
142       \fi
143       \ignorespaces
144     \fi
145   \else
146     \ifvmode
147       \if@nobreak\nobreak\else\if@noskipsec\nobreak\fi\fi
148     \fi
149   \fi}%
150 </2kernel | latexrelease>
151 <latexrelease>\EndIncludeInRelease
152 <latexrelease>\IncludeInRelease{2015/10/01}%
153 <latexrelease>          {\@esphack}{hyphenation and nobreak after space hack}%
154 <latexrelease>\def\@esphack{%
155 <latexrelease>  \relax
156 <latexrelease>  \ifhmode
157 <latexrelease>    \spacefactor\@savsf
158 <latexrelease>    \ifdim\@savsk>\z@
159 <latexrelease>      \ifdim\lastskip=\z@
160 <latexrelease>        \nobreak \hskip\z@skip
161 <latexrelease>      \fi

```



```

162 <latexrelease> \ignorespaces
163 <latexrelease> \fi
164 <latexrelease> \fi}%
165 <latexrelease>\EndIncludeInRelease
166 <latexrelease>\IncludeInRelease{2015/01/01}%
167 <latexrelease> {\@esphack}{hyphenation and nobreak after space hack}%
168 <latexrelease>\def\@esphack{%
169 <latexrelease> \relax
170 <latexrelease> \ifhmode
171 <latexrelease> \spacefactor\@savsf
172 <latexrelease> \ifdim\@savsk>\z@
173 <latexrelease> \nobreak \hskip\z@skip
174 <latexrelease> \ignorespaces
175 <latexrelease> \fi
176 <latexrelease> \fi}%
177 <latexrelease>\EndIncludeInRelease
178 <latexrelease>\IncludeInRelease{0000/00/00}%
179 <latexrelease> {\@esphack}{hyphenation and nobreak after space hack}%
180 <latexrelease>\def\@esphack{%
181 <latexrelease> \relax
182 <latexrelease> \ifhmode
183 <latexrelease> \spacefactor\@savsf
184 <latexrelease> \ifdim\@savsk>\z@
185 <latexrelease> \ignorespaces
186 <latexrelease> \fi
187 <latexrelease> \fi}%
188 <latexrelease>\EndIncludeInRelease
189 <*2ekernel>

```

(End definition for \@esphack.)

**\@Esphack** A variant of \@esphack that sets the @ignore switch to true (as \@esphack used to do previously). This is currently used only for floats and similar environments. w

```

190 </2ekernel>
191 <latexrelease>\IncludeInRelease{2015/01/01}%
192 <latexrelease> {\@Esphack}{hyphenation after space hack}%
193 <*2ekernel | latexrelease>
194 \def\@Esphack{%
195 \relax
196 \ifhmode
197 \spacefactor\@savsf
198 \ifdim\@savsk>\z@
199 \nobreak \hskip\z@skip
200 \@ignoretrue
201 \ignorespaces
202 \fi
203 \fi}%
204 </2ekernel | latexrelease>
205 <latexrelease>\EndIncludeInRelease
206 <latexrelease>\IncludeInRelease{0000/00/00}%
207 <latexrelease> {\@Esphack}{hyphenation after space hack}%
208 <latexrelease>\def\@Esphack{%
209 <latexrelease> \relax
210 <latexrelease> \ifhmode

```

```

211 <latexrelease> \spacefactor\@savsf
212 <latexrelease> \ifdim\@savsk>\z@
213 <latexrelease> \ignoretrue
214 <latexrelease> \ignorespaces
215 <latexrelease> \fi
216 <latexrelease> \fi}%
217 <latexrelease>\EndIncludeInRelease
218 <*2ekernel>

```

(End definition for \@Esphack.)

**\@vbsphack** Another variant which is useful for invisible things which should not live in vmode (this is how some people feel about marginals).

If it occurs in vmode then it enters hmode and ensures that \@savsk is nonzero so that the \ignorespaces is put in later. It is not used at present.

```

\def \@vbsphack{ %
  \relax \ifvmode
    \leavevmode
    \@savsk 1sp
    \@savsf \spacefactor
  \else
    \ifhmode
      \@savsk \lastskip
      \@savsf \spacefactor
    \fi
  \fi
}

```

(End definition for \@vbsphack.)

## 1.5 Vertical spacing

L<sup>A</sup>T<sub>E</sub>X supports the plain T<sub>E</sub>X commands \smallskip, \medskip and \bigskip. However, it redefines them using \vspace instead of \vskip.

Extra vertical space is added by the command \addvspace{<skip>}, which adds a vertical skip of <skip> to the document. The sequence \addvspace{<s1>} \addvspace{<s2>} is equivalent to \addvspace{<maximum of s1, s2>}.

\addvspace should be used only in vertical mode, and gives an error if it's not. The \addvspace command does *not* add vertical space if @minipage is true. The minipage environment uses this to inhibit the addition of extra vertical space at the beginning.

Penalties are put into the vertical list with the \addpenalty{<penalty>} command. It works properly when \addpenalty and \addvspace commands are mixed.

The @nobreak switch is set true used when in vertical mode and no page break should occur. (Right now, it is used only by the section heading commands to inhibit page breaking after a heading.)

```

\addvspace{SKIP} ==
BEGIN
  if vmode
    then if @minipage

```

```

        else if \lastskip =0
        then \vskip SKIP
        else if \lastskip < SKIP
            then \vskip -\lastskip
            \vskip SKIP
            else if SKIP < 0 and \lastskip >= 0
            then \vskip -\lastskip
            \vskip \lastskip + SKIP
        fi
    fi
else useful error message (CAR).
fi
END

```

**\@xaddvskip** Internal macro for \vspace handling the case that space has previously been added.

```

219 \def\@xaddvskip{%
220   \ifdim\lastskip<\@tempskipb
221     \vskip-\lastskip
222     \vskip\@tempskipb
223   \else
224     \ifdim\@tempskipb<\z@
225       \ifdim\lastskip<\z@
226         \else
227           \advance\@tempskipb\lastskip
228           \vskip-\lastskip
229           \vskip \@tempskipb
230         \fi
231       \fi
232     \fi}

```

*(End definition for \@xaddvskip.)*

**\addvspace** Add vertical space taking into account space already added, as described above.

```

233 </2ekernel>
234 <*2ekernel | latexrelease>
235 <latexrelease>\IncludeInRelease{2020/10/01}%
236 <latexrelease>          {\addvspace}{\addvspace calc support}%
237 \def\addvspace#1{%
238   \ifvmode
239     \if@minipage\else
240       \ifdim \lastskip =\z@
241         \@vspace@calcify{#1}%
242       \else
243         \setlength\@tempskipb{#1}%
244         \@xaddvskip
245       \fi
246     \fi
247   \else
248     \@noitemerr
249   \fi}
250 </2ekernel | latexrelease>
251 <latexrelease>\EndIncludeInRelease
252 <latexrelease>\IncludeInRelease{0000/00/00}%
253 <latexrelease>          {\addvspace}{\addvspace calc support}%

```

```

254 <latexrelease>
255 <latexrelease>\def\addvspace#1{%
256 <latexrelease> \ifvmode
257 <latexrelease> \if@minipage\else
258 <latexrelease> \ifdim \lastskip =\z@
259 <latexrelease> \vskip #1\relax
260 <latexrelease> \else
261 <latexrelease> \@tempskipb#1\relax
262 <latexrelease> \@xaddvskip
263 <latexrelease> \fi
264 <latexrelease> \fi
265 <latexrelease> \else
266 <latexrelease> \@noitemerr
267 <latexrelease> \fi}
268 <latexrelease>\EndIncludeInRelease
269 <*2ekernel>

```

(End definition for \addvspace.)

\addpenalty

```

270 </2ekernel>
271 <latexrelease>\IncludeInRelease{2015/01/01}%
272 <latexrelease> \{\addpenalty\}\addpenalty}%
273 <*2ekernel | latexrelease>

```

Fix provided by Donald (though the original fix was not good enough). In 2005 Plamen Tanovski discovered that this fix wasn't good enough either as the \vskip kept getting bigger if several \addpenalty commands followed each other. Donald kindly send a new fix.

```

274 \def\addpenalty#1{%
275 \ifvmode
276 \if@minipage
277 \else
278 \if@nobreak
279 \else
280 \ifdim\lastskip=\z@
281 \penalty#1\relax
282 \else
283 \@tempskipb\lastskip

```

We have to make sure the final \vskip seen by T<sub>E</sub>X is the correct one, namely \@tempskipb. However we may have to adjust for \prevdepth when placing the penalty but that should not affect the skip we pass on to T<sub>E</sub>X.

```

284 \begingroup
285 \@tempskipa\@tempskipb
286 \advance \@tempskipb
287 \ifdim\prevdepth>\maxdepth\maxdepth\else

```

If \prevdepth is -1000pt due to \nointerlineskip we better not add it!

```

288 \ifdim \prevdepth = -\@m\p@ \z@ \else \prevdepth \fi
289 \fi
290 \vskip -\@tempskipb
291 \penalty#1%
292 \ifdim\@tempskipa=\@tempskipb

```

Do nothing if the `\prevdepth` check made no adjustment.

```

293         \else
Combine the prevdepth adjustment into a single skip.
294         \advance\@tempskipb -\@tempskipa
295         \vskip \@tempskipb
296     \fi
The final skip is always the specified length.
297     \vskip \@tempskipa
298 \endgroup
299 \fi
300 \fi
301 \fi
302 \else
303     \noitemerr
304 \fi}%

305 \</2ekernel | latexrelease>
306 \<latexrelease>\EndIncludeInRelease
307 \<latexrelease>\IncludeInRelease{0000/00/00}%
308 \<latexrelease>        {\addpenalty}{\addpenalty}%
309 \<latexrelease>\def\addpenalty#1{%
310 \<latexrelease> \ifvmode
311 \<latexrelease>     \if@minipage
312 \<latexrelease>     \else
313 \<latexrelease>     \if@nobreak
314 \<latexrelease>     \else
315 \<latexrelease>     \ifdim\lastskip=\z@
316 \<latexrelease>     \penalty#1\relax
317 \<latexrelease>     \else
318 \<latexrelease>     \@tempskipb\lastskip
319 \<latexrelease>     \vskip -\lastskip
320 \<latexrelease>     \penalty#1%
321 \<latexrelease>     \vskip\@tempskipb
322 \<latexrelease>     \fi
323 \<latexrelease>     \fi
324 \<latexrelease>     \fi
325 \<latexrelease> \else
326 \<latexrelease>     \noitemerr
327 \<latexrelease> \fi}%
328 \<latexrelease>\EndIncludeInRelease
329 \<*2ekernel>

```

*(End definition for `\addpenalty`.)*

`\vspace`  
`\@vspace`  
`\@vspacer`

The new code for these commands depends on the following facts:

- The value of `prevdepth` is changed only when a box or rule is created and added to a vertical list;
- The value of `prevdepth` is used only when a box is created and added to a vertical list;
- The value of `prevdepth` is always local to the building of one vertical list.

```

330 \DeclareRobustCommand\vspace{\@ifstar\@vspacer\@vspace}

```

```

331 </2ekernel>
332 <*2ekernel | latexrelease>
333 <latexrelease>\IncludeInRelease{2020/10/01}%
334 <latexrelease>          {\@vspace}{Support calc in \vspace}%

```

We support calc syntax in the argument and therefore use \setlength.

```

335 \def\@vspace #1{%
336   \ifvmode
337     \@vspace@calcify{#1}%
338     \vskip\z@skip
339   \else
340     \@bsphack
341     \vadjust{\@restorepar
342               \@vspace@calcify{#1}%
343               \vskip\z@skip
344             }%
345     \@esphack
346   \fi}

347 \def\@vspacer#1{%
348   \ifvmode
349     \dimen@\prevdepth
350     \hrule \@height\z@
351     \nobreak
352     \@vspace@calcify{#1}%
353     \vskip\z@skip
354     \prevdepth\dimen@
355   \else
356     \@bsphack
357     \vadjust{\@restorepar
358               \hrule \@height\z@
359               \nobreak
360               \@vspace@calcify{#1}%
361               \vskip\z@skip}%
362     \@esphack
363   \fi}

364 </2ekernel | latexrelease>
365 <latexrelease>\EndIncludeInRelease
366 <latexrelease>\IncludeInRelease{0000/00/00}%
367 <latexrelease>          {\@vspace}{Support calc in \vspace}%
368 <latexrelease>

369 <latexrelease>\def\@vspace #1{%
370 <latexrelease>  \ifvmode
371 <latexrelease>    \vskip #1
372 <latexrelease>    \vskip\z@skip
373 <latexrelease>  \else
374 <latexrelease>    \@bsphack
375 <latexrelease>    \vadjust{\@restorepar
376 <latexrelease>                  \vskip #1
377 <latexrelease>                  \vskip\z@skip
378 <latexrelease>                }%
379 <latexrelease>    \@esphack
380 <latexrelease>  \fi}
381 <latexrelease>\def\@vspacer#1{%
382 <latexrelease>  \ifvmode

```

```

383 <latexrelease> \dimen@prevdepth
384 <latexrelease> \hrule \@height\z@
385 <latexrelease> \nobreak
386 <latexrelease> \vskip #1
387 <latexrelease> \vskip\z@skip
388 <latexrelease> \prevdepth\dimen@
389 <latexrelease> \else
390 <latexrelease> \@bsphack
391 <latexrelease> \vadjust{\@restorepar
392 <latexrelease> \hrule \@height\z@
393 <latexrelease> \nobreak
394 <latexrelease> \vskip #1
395 <latexrelease> \vskip\z@skip}%
396 <latexrelease> \@esphack
397 <latexrelease> \fi}
398 <latexrelease>\EndIncludeInRelease
399 <*2ekernel>

```

(End definition for `\vspace`, `\@vspace`, and `\@vspacer`.)

```

\smallskip
\medskip 400 \def\smallskip{\vspace\smallskipamount}
\bigskip 401 \def\medskip{\vspace\medskipamount}
402 \def\bigskip{\vspace\bigskipamount}

```

(End definition for `\smallskip`, `\medskip`, and `\bigskip`.)

```

\smallskipamount
\medskipamount 403 \newskip\smallskipamount \smallskipamount=3pt plus 1pt minus 1pt
\bigskipamount 404 \newskip\medskipamount \medskipamount =6pt plus 2pt minus 2pt
405 \newskip\bigskipamount \bigskipamount =12pt plus 4pt minus 4pt

```

(End definition for `\smallskipamount`, `\medskipamount`, and `\bigskipamount`.)

## 1.6 Horizontal space (and breaks)

`\nobreakdashes` This idea is borrowed from the `amsmath` package but here we define a robust command. This command is a low-level command designed for use only before hyphens or dashes (such as `-`, `--`, or `---`).

It could probably be better implemented: it may need its own private token register and temporary command.

Setting the hyphen in a box and then unboxing it means that the normal penalty will not be added after it—and if the penalty is not there a break will not be taken (unless an explicit penalty or glue follows, thus the final `\nobreak`).

Note that even if it is not followed by a `'-`', it still leaves vmode and sets the space-factor; so use it carefully!

```

406 \DeclareRobustCommand{\nobreakdashes}{%
407   \leavevmode
408   \toks@{}%
409   \def\reserved@a##1{\toks@\expandafter{\the\toks@-}%
410     \futurelet\@let@token \reserved@b}%
411   \def\reserved@b  {\ifx\@let@token -%
412     \expandafter\reserved@a

```

```

413             \else
414             \setbox\z@ \hbox{\the\toks@\nobreak}%
415             \unhbox\z@
416             \spacefactor\sfcode'\-
417             \fi}%
418 \futurelet\@let@token \reserved@b
419 }

```

(End definition for \nobreakdashes.)

**\nobreakspace** This is a robust command that produces a horizontal space at which, in paragraph-mode, a line-break is not possible. We then define an active ~ to expand to it since this is the documented behaviour of ~. One reason for introducing this is that some 8-bit input encodings have a slot for such a space and we do not want to use active characters as the L<sup>A</sup>T<sub>E</sub>X internal commands.

**\@xobeysp**

The braces in the definition of ~ are needed to ensure that a following space is preserved when reading to/from internal files.

We need to keep \@xobeysp as it is widely used; so here it is let to the non-robust command \nobreakspace .

```

420 \DeclareRobustCommand{\nobreakspace}{%
421   \leavevmode\nobreak\ }
422 \catcode '\~=13
423 \def~{\nobreakspace{}}
424 \expandafter\let\expandafter\@xobeysp\csname nobreakspace \endcsname

```

(End definition for \nobreakspace and \@xobeysp.)

**\@** Placed before a '?', makes it a sentence-ending period. Does the right thing for other punctuation marks as well. Does this by setting spacefactor to 1000.

```

425 </2ekernel>
426 <latexrelease>\IncludeInRelease{2015/01/01}%
427 <latexrelease>          {\@}{Space after \@}%
428 <*2ekernel | latexrelease>
429 \def\@{\spacefactor\@m{}}%
430 </2ekernel | latexrelease>
431 <latexrelease>\EndIncludeInRelease
432 <latexrelease>\IncludeInRelease{0000/00/00}%
433 <latexrelease>          {\@}{Space after \@}%
434 <latexrelease>\def\@{\spacefactor\@m}%
435 <latexrelease>\EndIncludeInRelease
436 <*2ekernel>

```

(End definition for \@.)

**\hspace**

```

437 \DeclareRobustCommand\hspace{\@ifstar\@hspacer\@hspace}

```

(End definition for \hspace.)



`\@hspace`

```
438 </2ekernel>
439 <*2ekernel | latexrelease>
440 <latexrelease>\IncludeInRelease{2020/10/01}%
441 <latexrelease>{\@hspace}{Support calc with \hspace}%
442 \def\@hspace#1{\begingroup\setlength\skip@{#1}\hskip\skip@\endgroup}
443 </2ekernel | latexrelease>
444 <latexrelease>\EndIncludeInRelease
445 <latexrelease>\IncludeInRelease{0000/00/00}%
446 <latexrelease>{\@hspace}{Support calc with \hspace}%
447
448 <latexrelease>
449 <latexrelease>\def\@hspace#1{\hskip #1\relax}
450 <latexrelease>\EndIncludeInRelease
451 <*2ekernel>
```

*(End definition for \@hspace.)*

`\@hspacer` Extra `\hskip` Opt added 1985/17/12 to guard against a following `\unskip \relax` added 13 Oct 88 for usual T<sub>E</sub>X lossage replaced both changes by `\hskip\z@skip` 27 Nov 91

```
452 \def\@hspacer#1{\vrule \@width\z@\nobreak
453 \hspace{#1}\hskip \z@skip}
```

*(End definition for \@hspacer.)*

`\fill`

```
454 \newskip\fill
455 \fill = Opt plus 1fill
```

*(End definition for \fill.)*

`\stretch`

```
456 \def\stretch#1{\z@ \@plus #1fill\relax}
```

*(End definition for \stretch.)*

```
457 </2ekernel>
458 <*2ekernel | latexrelease>
459 <latexrelease>\IncludeInRelease{2018/12/01}%
460 <latexrelease>{\thinspace}{Start LR-mode}%
```

`\enspace`

```
461 \DeclareRobustCommand\enspace{\leavevmode@ifvmode\kern.5em }
```

*(End definition for \enspace.)*

`\leavevmode@ifvmode` Leave vmode but only if we are really in vmode, otherwise the expansion is empty (which is not the case with the default definition).

```
462 \protected\def\leavevmode@ifvmode{\ifvmode\expandafter\indent\fi}
```

```

(End definition for \leavevmode@ifvmode.)

463 </2ekernel | latexrelease>
464 <latexrelease>\EndIncludeInRelease
465 <latexrelease>\IncludeInRelease{0000/00/00}%
466 <latexrelease>{\thinspace}{Start LR-mode}%
467 <latexrelease>\def\thinspace{\kern .16667em }
468 <latexrelease>\def\negthinspace{\kern -.16667em }
469 <latexrelease>\def\enspace{\kern .5em }
470 <latexrelease>\let\leavevmode@ifvmode\@undefined
471 <latexrelease>\EndIncludeInRelease
472 <*2ekernel>

\enskip
\quad 473 \def\enskip{\hskip .5em\relax}
\qqquad 474 \def\quad{\hskip 1em\relax}
475 \def\qqquad{\hskip 2em\relax}

(End definition for \enskip, \quad, and \qqquad.)
For Unicode engines, make the Unicode soft hyphen an active character defined as
\-.

476 \ifx\Umathcode\@undefined\else
477 \catcode "AD=13
478 \def^^ad{\-}
479 \fi

\obeycr The following definitions will probably get deleted or moved to compatibility mode soon.
\restorecr
480 {\catcode'\^M=13 \gdef\obeycr{\catcode'\^M13 \def^^M{\\\relax}%
481 \gobblecr}%
482 {\catcode'\^M=13 \gdef\gobblecr{\@ifnextchar
483 \@gobble\ignorespaces}}
484 \gdef\restorecr{\catcode'\^M5 }}

(End definition for \obeycr and \restorecr.)

485 </2ekernel>

```

# File q

## ltlogos.dtx

### 1 Logos

Various logos are defined here.

`\TeX` The  $\text{\TeX}$  logo, adjusted so that a full stop after the logo counts as ending a sentence.

```

1 <*/2kernel>
2 \DeclareRobustCommand\TeX{T\kern-.1667em\lower.5ex\hbox{E}\kern-.125emX\@}
```

*(End definition for \TeX.)*

`\LaTeX` The  $\text{\LaTeX}$  logo.

```

3 \DeclareRobustCommand{\LaTeX}{L\kern-.36em%
4     {\sbox\z@ T%
5       \vbox to\ht\z@{\hbox{\check@mathfonts
6                             \fontsize\sf@size\z@
7                             \math@fontsfalse\selectfont
8                             A}%
9                             \vss}%
10      }%
11      \kern-.15em%
12      \TeX}
```

*(End definition for \LaTeX.)*

`\LaTeXe` The  $\text{\LaTeX} 2_{\epsilon}$  logo as proposed by A-W designers.

```

13 \DeclareRobustCommand{\LaTeXe}{\mbox{\m@th
14   \if b\expandafter\@car\@series\@nil\boldmath\fi
15   \LaTeX\kern.15em2$_{\textstyle\varepsilon}$}}
16 </2kernel>
```

*(End definition for \LaTeXe.)*

# File r

## ltfiles.dtx

### 1 File Handling

The following user commands are defined in this part:

<code>\document</code>	<code>(ie \begin{document})</code>
	Reads in the .AUX files and <code>\catcode</code> 's @ to 12.
<code>\nofiles</code>	
	Suppresses all file output by setting <code>\@files</code> false.
<code>\includeonly</code>	<code>{\NAME1, ... ,NAMEn}</code>
	Causes only parts NAME1, ... ,NAMEn to be read by their <code>\include</code> commands. Works by setting <code>partsw</code> true and setting <code>\@partlist</code> to NAME1, ... ,NAMEn.
<code>\include</code>	<code>{\NAME}</code>
	Does an <code>\input</code> NAME unless <code>\@partsw</code> is true and NAME is not in <code>\@partlist</code> . If <code>\@files</code> is true, then it directs .AUX output to NAME.AUX, including a checkpoint at the end.
<code>\input</code>	<code>{\NAME}</code>
	The same as TeX's <code>\input</code> , except it allows optional braces around the file name. In $\text{\LaTeX 2}_{\epsilon}$ , it also avoids the primitive 'missing file' error, if the file can not be found.
<code>\IfFileExists</code>	<code>{\NAME}{\then}{\else}</code>
	If the file exists on the system, execute <i>then</i> otherwise execute <i>else</i> .
<code>\InputIfFileExists</code>	<code>{\NAME}{\then}{\else}</code>
	If the file exists on the system, execute <i>then</i> and input NAME otherwise execute <i>else</i> . <i>Historical \LaTeX 2.09 comments (not necessarily accurate any more):</i>

```

1 <*2kernel>
2 \message{files,}

```

#### VARIABLES, SWITCHES AND INTERNAL COMMANDS:

<code>\@mainaux</code>	: Output file number for main .AUX file.
<code>\@partaux</code>	: Output file number for current part's .AUX file.
<code>\@auxout</code>	: Either <code>\@mainout</code> or <code>\@partout</code> , depending on which .AUX file output goes to.
<code>\@input{foo}</code>	: If file foo exists, then <code>\input</code> 's it, otherwise types a warning message.
<code>@files</code>	: Switch – set false if no .AUX, .TOC, .IDX etc files are to be written
<code>@partsw</code>	: Set true by a <code>\includeonly</code> command.
<code>\@partlist</code>	: Set to the argument of the <code>\includeonly</code> command.
<code>\cp@FOO</code>	: The checkpoint for <code>\include</code> 'd file FOO.TEX, written by <code>\@writeckpt</code> at the end of file FOO.AUX

```

\includeonly{FILELIST} ==
BEGIN

```

```

\@partsw := T
\@partlist := FILELIST
END

\include{FILE} ==
BEGIN
\clearpage
if \@filesw = T
then \immediate\write\@mainaux{\string\@input{FILE.AUX}}
fi
if \@partsw = T
then \@tempswa := F
\reserved@a := FILE
for \reserved@a := \@partlist
do if eval(\reserved@a) = eval(\reserved@b)
then \@tempswa := T fi
od
fi

if \@tempswa = T
then \@auxout := \@partaux
if \@filesw = T
then \immediate\openout\@partaux{FILE.AUX}
\immediate\write\@partaux{\relax}
fi
\@input{FILE.TEX}
\clearpage
\@writeckpt{FILE}
if @filesw then \closeout \@partaux fi
\@auxout := \@mainaux
else \cp@FILE
fi
END

\@writeckpt{FILE} ==
BEGIN
if \@filesw = T
\immediate\write on file \@partaux:
\@setckpt{FILE}{
%% }
for \reserved@a := \cl@ckpt
do \immediate\write on file \@partaux:
\global\string\setcounter
{eval(\reserved@a)}{eval(\c@eval(\reserved@a))}
od
%% {
\immediate\write on file \@partaux: }
fi
END

\@setckpt{FILE}{LIST} ==
BEGIN

```

```
G \cp@FILE := LIST
END
```

```
INITIALIZATION
\@tempswa := T
```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

```
\@mainaux
\@partaux 3 \newwrite\@mainaux
          4 \newwrite\@partaux
```

*(End definition for \@mainaux and \@partaux.)*

```
\if@files
\if@partsw 5 \newif\if@files \@filestrue
          6 \newif\if@partsw \@partswfalse
```

*(End definition for \if@files and \if@partsw.)*

**\@clubpenalty** This stores the current normal (non-infinite) value of `\clubpenalty`; it should therefore be reset whenever the normal value is changed (as in the bibliography in the standard styles).

```
7 \newcount\@clubpenalty
8 \@clubpenalty \clubpenalty
```

*(End definition for \@clubpenalty.)*

```
\document
```

```
9 \</2kernel>
10 \<latexrelease>\IncludeInRelease{2020/10/01}%
11 \<latexrelease> {\document}{Added hook to load l3backend code}%
12 \<*2kernel | latexrelease>
13 \def\document{%
```

We do cancel the grouping as part of the `\begin` handling (this is now done inside `\begin` instead) so that the `env/<env>/begin` hook is not hidden inside `\begingroup ... \endgroup`.

```
14 % \endgroup
15 \UseOneTimeHook{begindocument/before}%
16 \<kernel@after@begindocument@before
```

Added hook to load l3backend code:

```
17 \<expl@sys@load@backend@@
18 \ifx\@unusedoptionlist\@empty\else
19 \<latex@warning@no@line{Unused global option(s):^^J%
20 \spaces[\@unusedoptionlist]}%
21 \fi
22 \<colht\textheight
23 \<colroom\textheight \vsize\textheight
24 \<columnwidth\textwidth
25 \<clubpenalty\clubpenalty
26 \if@twocolumn
27 \advance\columnwidth -\columnsep
```

```

28     \divide\columnwidth\tw@ \hsize\columnwidth \@firstcolumntrue
29 \fi
30 \hsize\columnwidth \linewidth\hsize
31 \begingroup\@floatplacement\@dblfloatplacement
32     \makeatletter\let\@writefile\@gobbletwo

33     \global \let \@multiplelabels \relax
34     \input{\jobname.aux}%
35 \endgroup
36 \if@files
37     \immediate\openout\@mainaux\jobname.aux
38     \immediate\write\@mainaux{\relax}%
39 \fi

```

Dateline 1991/03/26: FMi added `\process@table` to support NFSS; This will also work with old lfonts if no other style defines `\process@table`. The following line forces the initialization of the math fonts.

```

40 \process@table
41 \let\glb@currsize\@empty % Force math initialization.

42 \normalsize
43 \everypar{}%

```

So that punctuation in headings is not disturbed by verbatim or other local changes to the space factor codes, save the document default here. This will be locally reset by the output routine. For special cases a class may want to define `\normalsfcodes` directly, in case that definition will be used. (This is an old bug, problem existed in L<sup>A</sup>T<sub>E</sub>X 2.0x and plain T<sub>E</sub>X.)

```

44 \ifx\normalsfcodes\@empty
45     \ifnum\sfcode'\.=\@m
46         \let\normalsfcodes\frenchspacing
47     \else
48         \let\normalsfcodes\nonfrenchspacing
49 \fi
50 \fi

```

For similar reasons also save the default language, this will be reset locally in the output routine. In particular it allows hyphenation in the page head even if the page break happens in verbatim. If this has already been set by a package, set to the value of `\language` at this point.

```

51 \ifx\document@default@language\m@ne
52     \chardef\document@default@language\language
53 \fi

```

Way back in 1991 (08/26) FMi & RmS set the `\@noskipsec` switch to true in the preamble and to false here. This was done to trap lists and related text in the preamble but it does not catch everything; hence Change 1.1g was introduced.

```

54 \@noskipsecfalse

55 \let \@refundefined \relax

```

Just before disabling the preamble commands we execute the begin document hook which contains any code contributed by `\AtBeginDocument`. Also disable the gathering of the file list, if no `\listfiles` has been issued. `\AtBeginDocument` is redefined at this point so that and such commands that get into the hook do not chase their tail...

```

56 \@kernel@before@begindocument
57 \UseOneTimeHook{begindocument}%
58 \@kernel@after@begindocument

```

Most of the following assignments will be done globally in case the user adds something like `\begin{multicols}` to the document hook, i.e. starts are group in `\begin{document}`.

Since a value of exactly 0pt for `\topskip` causes `\twocolumn[]` to misbehave, we add this check, hoping that it will not cause any problems elsewhere.

```

59 \ifdim\topskip<1sp\global\topskip 1sp\relax\fi
60 \global\@maxdepth\maxdepth
61 \global\let\@begindocumenthook\@undefined
62 \ifx\@listfiles\@undefined
63 \global\let\@filelist\relax
64 \global\let\@addtofilelist\@gobble
65 \fi

```

At the very end we disable all preamble commands. This has to happen after the begin document hooks was executed so that this hook can still use such commands.

```

66 \gdef\do##1{\global\let ##1\@notprerr}%
67 \@preamblecmds

```

The next line saves tokens and also allows `\@nodocument` to be used directly to trap preamble errors.

```

68 \global\let \@nodocument \relax

```

The next line is a pure safety measure in case a do list is ever expanded at the wrong place. In addition it will save a few tokens to get rid of the above definition.

```

69 \global\let\do\noexpand
70 \UseOneTimeHook{begindocument/end}%

```

Use of the hook might mean that we are already in horizontal mode, so ignore the space after `\begin{document}`.

```

71 \ignorespaces}

```

The `begindocument` hook already existed in the kernel since 1994 under the name `\atbegindocumenthook` the additional ones are originally from the `etoolbox` package under the names `\@endpreamblehook` `\afterpreamble`.

```

72 \NewHook{begindocument}
73 \NewHook{begindocument/before}
74 \NewHook{begindocument/end}

```

Above we used two kernel only hooks to be run after the public `begindocument/before` and after `begindocument` hooks.

In `\@kernel@after@begindocument@before` we already place one action: drop the fast execution code for the `env/document/begin` hook. That hook marks the end of the preamble and should therefore only be run once. In a normal document that is anyway the case (so the code would just sit there taking up space afterwards, which these days is rather harmless), however, in more complicated scenarios where several full documents are combined to a single document it might get applied several times with harmful effects. We therefore explicitly drop it at this point. the coding is somewhat obscure due to the name of the macro which requires constructing.

```

75 \edef \@kernel@after@begindocument@before {%
76 \let\expandafter\noexpand\csname

```

```

\@kernel@after@begindocument@before
\@kernel@before@begindocument
\@kernel@after@begindocument

```



```

77     __hook env/document/begin\endcsname
78     \noexpand\@empty}

```

These internal hooks are already declared earlier (in `ltxpl`) so that other modules could write to them.

```

79 %\let \@kernel@before@begindocument \@empty
80 %\let \@kernel@after@begindocument \@empty

81 </2ekernel | latexrelease>
82 <latexrelease>\EndIncludeInRelease

83 <latexrelease>\IncludeInRelease{2017/04/15}%
84 <latexrelease> {\document}{Save language for hyphenation}%
85 <latexrelease>
86 <latexrelease>\def\document{\endgroup
87 <latexrelease> \ifx\@unusedoptionlist\@empty\else
88 <latexrelease> \@latex@warning@no@line{Unused global option(s):^^J%
89 <latexrelease> \spaces[\@unusedoptionlist]}%
90 <latexrelease> \fi
91 <latexrelease> \@colht\textheight
92 <latexrelease> \@colroom\textheight \vsize\textheight
93 <latexrelease> \columnwidth\textwidth
94 <latexrelease> \@clubpenalty\clubpenalty
95 <latexrelease> \if@twocolumn
96 <latexrelease> \advance\columnwidth -\columnsep
97 <latexrelease> \divide\columnwidth\tw@ \hsize\columnwidth \@firstcolumntrue
98 <latexrelease> \fi
99 <latexrelease> \hsize\columnwidth \linewidth\hsize
100 <latexrelease> \begingroup\@floatplacement\@dblfloatplacement
101 <latexrelease> \makeatletter\let\@writefile\@gobbletwo
102 <latexrelease> \global \let \@multiplelabels \relax
103 <latexrelease> \input{\jobname.aux}%
104 <latexrelease> \endgroup
105 <latexrelease> \if@filesw
106 <latexrelease> \immediate\openout\@mainaux\jobname.aux
107 <latexrelease> \immediate\write\@mainaux{\relax}%
108 <latexrelease> \fi
109 <latexrelease> \process@table
110 <latexrelease> \let\glb@currsize\@empty % Force math initialization.
111 <latexrelease> \normalsize
112 <latexrelease> \everypar{}%
113 <latexrelease> \ifx\normalsfcodes\@empty
114 <latexrelease> \ifnum\sfcode'\.=\@m
115 <latexrelease> \let\normalsfcodes\frenchspacing
116 <latexrelease> \else
117 <latexrelease> \let\normalsfcodes\nonfrenchspacing
118 <latexrelease> \fi
119 <latexrelease> \fi
120 <latexrelease> \ifx\document@default@language\m@ne
121 <latexrelease> \chardef\document@default@language\language
122 <latexrelease> \fi
123 <latexrelease> \noskipsecfalse
124 <latexrelease> \let \@refundefined \relax
125 <latexrelease> \let\AtBeginDocument\@firstofone
126 <latexrelease> \@begindocumenthook

```

```

127 <latexrelease> \ifdim\topskip<1sp\global\topskip 1sp\relax\fi
128 <latexrelease> \global\@maxdepth\maxdepth
129 <latexrelease> \global\let\@begindocumenthook\@undefined
130 <latexrelease> \ifx\@listfiles\@undefined
131 <latexrelease> \global\let\@filelist\relax
132 <latexrelease> \global\let\@addtofilelist\@gobble
133 <latexrelease> \fi
134 <latexrelease> \gdef\do##1{\global\let ##1\@notprerr}%
135 <latexrelease> \@preamblecmds
136 <latexrelease> \global\let \@nodocument \relax
137 <latexrelease> \global\let\do\noexpand
138 <latexrelease> \ignorespaces}
139 <latexrelease>\EndIncludeInRelease
140 <latexrelease>
141 <latexrelease>\IncludeInRelease{0000/00/00}%
142 <latexrelease> {\document}{Save language for hyphenation}
143 <latexrelease>\def\document{\endgroup
144 <latexrelease> \ifx\@unusedoptionlist\@empty\else
145 <latexrelease> \@latex@warning@no@line{Unused global option(s):^^J%
146 <latexrelease> \spaces[\@unusedoptionlist]}}%
147 <latexrelease> \fi
148 <latexrelease> \@colht\textheight
149 <latexrelease> \@colroom\textheight \vsize\textheight
150 <latexrelease> \columnwidth\textwidth
151 <latexrelease> \@clubpenalty\clubpenalty
152 <latexrelease> \if@twocolumn
153 <latexrelease> \advance\columnwidth -\columnsep
154 <latexrelease> \divide\columnwidth\tw@ \hsize\columnwidth
155 <latexrelease> \@firstcolumntrue
156 <latexrelease> \fi
157 <latexrelease> \hsize\columnwidth \linewidth\hsize
158 <latexrelease> \begingroup\@floatplacement\@dblfloatplacement
159 <latexrelease> \makeatletter\let\@writefile\@gobbletwo
160 <latexrelease> \global \let \@multiplelabels \relax
161 <latexrelease> \input{\jobname.aux}%
162 <latexrelease> \endgroup
163 <latexrelease> \if@filesw
164 <latexrelease> \immediate\openout\@mainaux\jobname.aux
165 <latexrelease> \immediate\write\@mainaux{\relax}%
166 <latexrelease> \fi
167 <latexrelease> \process@table
168 <latexrelease> \let\glb@currsz\@empty
169 <latexrelease> \normalsize
170 <latexrelease> \everypar{}%
171 <latexrelease> \ifx\normalsfcodes\@empty
172 <latexrelease> \ifnum\sfcode'\@m
173 <latexrelease> \let\normalsfcodes\frenchspacing
174 <latexrelease> \else
175 <latexrelease> \let\normalsfcodes\nonfrenchspacing
176 <latexrelease> \fi
177 <latexrelease> \fi
178 <latexrelease> \@noskipsecfalse
179 <latexrelease> \let \@refundefined \relax
180 <latexrelease> \let\AtBeginDocument\@firstofone

```

```

181 <latexrelease> \@begindocumenthook
182 <latexrelease> \ifdim\topskip<1sp\global\topskip 1sp\relax\fi
183 <latexrelease> \global\@maxdepth\maxdepth
184 <latexrelease> \global\let\@begindocumenthook\@undefined
185 <latexrelease> \ifx\@listfiles\@undefined
186 <latexrelease> \global\let\@filelist\relax
187 <latexrelease> \global\let\@addtofilelist\@gobble
188 <latexrelease> \fi
189 <latexrelease> \gdef\do##1{\global\let ##1\@notprerr}%
190 <latexrelease> \@preamblecmds
191 <latexrelease> \global\let \@nodocument \relax
192 <latexrelease> \global\let\do\noexpand
193 <latexrelease> \ignorespaces}
194 <latexrelease>\EndIncludeInRelease
195 <*2ekernel>
196 \@onlypreamble\document

```

(End definition for \document and others.)

**\normalsfcodes** The setting of \@empty is just a flag. This command may be defined in a class or package file. If it is still \@empty at \begin{document} it will be defined to be \frenchspacing or \nonfrenchspacing, depending on which of those appears to be in effect at that point.

```
197 \let\normalsfcodes\@empty
```

(End definition for \normalsfcodes.)

**\nofiles** Set \@fileswfalse which suppresses the places where L<sup>A</sup>T<sub>E</sub>X makes \immediate writes. The \makeindex and \makeglossary are disabled. \protected@write is redefined not to write to the file specified, but rather to write a blank line to the log file. This ensures that a <whatsit> node is still created, and so spacing is not affected by the \nofiles command; to ensure this more generally, the \if@nobreak test is needed.

```

198 \def\nofiles{%
199   \@fileswfalse
200   \typeout{No auxiliary output files.^^J}%
201   \long\def\protected@write##1##2##3%
202     {\write\m@ne{}\if@nobreak\ifvmode\nobreak\fi\fi}%
203   \let\makeindex\relax
204   \let\makeglossary\relax}
205 \@onlypreamble\nofiles

```

(End definition for \nofiles.)

**\protected@write** This takes three arguments: an output stream, some initialization code, and some text to write. It then writes this, with appropriate handling of \protect and \thepage.

```

206 \long\def \protected@write#1#2#3{%
207   \begingroup
208   \let\thepage\relax
209   #2%
210   \let\protect\@unexpandable@protect
211   \edef\reserved@a{\write#1{#3}}%
212   \reserved@a
213   \endgroup
214   \if@nobreak\ifvmode\nobreak\fi\fi
215 }

```

(End definition for \protected@write.)

```
216 \let\@auxout=\@mainaux
```

`\include` In the definition of `\include`, `\def\reserved@a` changed to `\edef\reserved@a` to be  
`\includeonly` consistent with the `\edef` in `\includeonly`. (Suggested by Rainer Schöpf & Frank Mittelbach. Change made 20 Jul 88.)

Changed definition of `\include` to allow space at end of file name — otherwise, typing `\include{foo }` would cause L<sup>A</sup>T<sub>E</sub>X to overwrite `foo.tex`. Change made 24 May 89, suggested by Rainer Schöpf and Frank Mittelbach

Made `\include` check for being used inside an `\include`'d file, as this will not work and cause surprising results.

```
217 </2kernel>
218 <*2kernel | latexrelease>
219 <latexrelease> \IncludeInRelease{2020/10/01}%
220 <latexrelease> { \includeonly } { Spaces in file names }%

221 \def\include#1{\relax
222   \ifnum\@auxout=\@partaux
223     \latexerror{\string\include\space cannot be nested}\@eha
224   \else
```

Here the normalization will add `.tex` for all files, (it uses the same normalization as the hooks), so we need to remove that manually. `\@strip@tex@ext` does that.

```
225   \set@curr@file{#1}%
226   \edef\@curr@file{\@strip@tex@ext\@curr@file}%
```

For historical reasons `\@include` expects an argument delimited by a space. This is kept (though unnecessary now) to avoid errors in other packages that use `\@include` directly.

```
227   \expandafter\@include\expandafter{\@curr@file} % deliberate space
228   \fi}
```

Here in `\includeonly` we also need to strip `.tex` after normalization:

```
229 \def\includeonly#1{%
230   \@partswtrue
```

Because the argument to `\includeonly` is a comma-separated list of filenames where there may be comma's preceding some of the filenames or trailing them. Therefore we need to take the list apart, remove the unwanted spaces while leaving the spaces *in* the filenames intact.

```
231   \let\@partlist\@empty
232   \@for\reserved@a:=#1 \do
233   {%
234     \expandafter\set@curr@file\expandafter{\reserved@a}%
235     \ifx\@partlist\@empty
236       \edef\@partlist{\@strip@tex@ext\@curr@file}%
237     \else
238       \edef\@partlist{\@partlist,\@strip@tex@ext\@curr@file}%
239     \fi
240   }%
241 }
242 \@onlypreamble\includeonly
```

(End definition for `\include` and `\includeonly`.)

`\@strip@tex@ext` These macros take a (`\detokenized` file name and remove any `.tex` extension). Extra care is taken to not remove the string `.tex` from the middle of a file name: it is only removed if it's the very last thing in the file name.

`\@strip@tex@ext@aux`

```

243 \def\reserved@a#1{%
244 \def\@strip@tex@ext##1{%
245   \expandafter\@strip@tex@ext@aux
246     ##1\@nil\@nil
247     #1\@nil\relax\@nnil}
248 \def\@strip@tex@ext@aux##1#1\@nil##2\@nnil{%
249   \ifx\relax##2\@empty
250     \expandafter\@cdr\expandafter\@empty\@cdr{}\##1%
251   \else##1\fi}}%
252 \expandafter\reserved@a
253 \expandafter{\detokenize{.tex}}
254 /2kernel | latexrelease)

(End definition for \@strip@tex@ext and \@strip@tex@ext@aux.)

255 <latexrelease>\EndIncludeInRelease
256 <latexrelease>\IncludeInRelease{2019/10/01}%
257 <latexrelease>          {\includeonly}{Spaces in file names}%
258 <latexrelease>
259 <latexrelease>\def\includeonly#1{%
260 <latexrelease>  \@partswtrue
261 <latexrelease>  \set@curr@file{\zap@space#1 \@empty}%
262 <latexrelease>  \let\@partlist\@curr@file
263 <latexrelease>  }
264 <latexrelease>
265 <latexrelease>\def\include#1{\relax
266 <latexrelease>  \ifnum\@auxout=\@partaux
267 <latexrelease>    \@latex@error{string\include\space cannot be nested}\@eha
268 <latexrelease>  \else
269 <latexrelease>    \set@curr@file{#1 }%
270 <latexrelease>    \expandafter\@include\@curr@file
271 <latexrelease>  \fi}
272 <latexrelease>
273 <latexrelease>\let\@strip@tex@ext\@undefined
274 <latexrelease>\let\@strip@tex@ext@aux\@undefined
275 <latexrelease>
276 <latexrelease>\EndIncludeInRelease

277 <latexrelease>\IncludeInRelease{0000/00/00}%
278 <latexrelease>          {\includeonly}{Spaces in file names}%
279 <latexrelease>\def\includeonly#1{%
280 <latexrelease>  \@partswtrue
281 <latexrelease>  \edef\@partlist{\zap@space#1 \@empty}}
282 <latexrelease>
283 <latexrelease>\def\include#1{\relax
284 <latexrelease>  \ifnum\@auxout=\@partaux
285 <latexrelease>    \@latex@error{string\include\space cannot be nested}\@eha
286 <latexrelease>  \else \@include#1 \fi}
287 <latexrelease>
288 <latexrelease>\EndIncludeInRelease
289 *2kernel)

```

`\@include`

```
290 </2ekernel>
291 <*2ekernel | latexrelease>
292 <latexrelease>\IncludeInRelease{2022/06/01}%
293 <latexrelease>{\@include}{Spaces in file names and hooks}%

294 \def\@include#1 {%
295 \ifx\@nodocument\relax
296 \clearpage
297 \if@filesw
298 \immediate\write\@mainaux{\string\@input{#1.aux}}%
299 \fi
300 \@tempswattrue
301 \if@partsw
302 \@tempswafalse
303 \edef\reserved@a{#1}%
304 \@for\reserved@b:=\@partlist\do
305 {\ifx\reserved@a\reserved@b\@tempswattrue\fi}%
306 \fi
307 \if@tempswa
308 \let\@auxout\@partaux
309 \if@filesw
310 \immediate\openout\@partaux "#1.aux"
311 \immediate\write\@partaux{\relax}%
312 \fi
```

Now before going to the hooks we need to set `\CurrentFile`:

```
313 %-----
314 \@filehook@set@CurrentFile
```

Execute the before hooks just after we switched the .aux file ...

```
315 \UseHook{include/before}%
316 \UseOneTimeHook{include/#1/before}%
317 %-----
318 \@input@{#1.tex}%
319 %-----
```

... then end hooks ...

```
320 \UseOneTimeHook{include/#1/end}%
321 \UseHook{include/end}%
322 %-----
323 \clearpage
324 %-----
```

... and after the `\clearpage` the after hooks followed by another `\clearpage` just in case new material got added (after all we need to be in well defined state after the `\include`).

```
325 \UseOneTimeHook{include/#1/after}%
326 \UseHook{include/after}%
327 \clearpage
328 %-----
329 \@writeckpt{#1}%
330 \if@filesw
331 \immediate\closeout\@partaux
```

```

332 \fi
333 \else

```

If the file is not included, reset `\deadcycles`, so that a long list of non-included files does not generate an ‘Output loop’ error.

```

334 \deadcycles\z@
335 \@nameuse{cp@#1}%

```

We also execute a hook in this case, first a general used for every include file that is exclude and then a specific one that contains the name of the include file.

```

336 %-----
337 \UseHook{include/excluded}%
338 \UseOneTimeHook{include/#1/excluded}%
339 %-----
340 \fi
341 \let\@auxout\@mainaux
342 \else
343 \@latex@warning{%
344 \noexpand\include should only be used after \string\begin{document}}%
345 \@input@{#1}%
346 \fi}

```

Now declare the non-generic include hooks used above:

```

347 \NewHook{include/before}
348 \NewReversedHook{include/end}
349 \NewReversedHook{include/after}
350 \NewHook{include/excluded}
351 \langle latexrelease \rangle \EndIncludeInRelease
352 \langle /2ekernel | latexrelease \rangle

353 \langle latexrelease \rangle \IncludeInRelease{2020/10/01}%
354 \langle latexrelease \rangle \{\@include\}{Spaces in file names and hooks}%
355 \langle latexrelease \rangle \EndIncludeInRelease
356 \langle latexrelease \rangle \def\@include#1 {%
357 \langle latexrelease \rangle \ifx\@nodocument\relax
358 \langle latexrelease \rangle \clearpage
359 \langle latexrelease \rangle \if@filesw
360 \langle latexrelease \rangle \immediate\write\@mainaux{\string\@input{#1.aux}}%
361 \langle latexrelease \rangle \fi
362 \langle latexrelease \rangle \@tempswatrue
363 \langle latexrelease \rangle \if@partsw
364 \langle latexrelease \rangle \@tempswafalse
365 \langle latexrelease \rangle \edef\reserved@a{\@partlist\do
366 \langle latexrelease \rangle \@for\reserved@a:=\@partlist\do
367 \langle latexrelease \rangle \{\ifx\reserved@a\reserved@b\@tempswatrue\fi}%
368 \langle latexrelease \rangle \fi
369 \langle latexrelease \rangle \if@tempswa
370 \langle latexrelease \rangle \let\@auxout\@partaux
371 \langle latexrelease \rangle \if@filesw
372 \langle latexrelease \rangle \immediate\openout\@partaux "#1.aux"
373 \langle latexrelease \rangle \immediate\write\@partaux{\relax}%
374 \langle latexrelease \rangle \fi
375 \langle latexrelease \rangle \@filehook@set@CurrentFile
376 \langle latexrelease \rangle \UseHook{include/before}%
377 \langle latexrelease \rangle \UseOneTimeHook{include/#1/before}%

```

```

378 <latexrelease> \input@{#1.tex}%
379 <latexrelease> \UseOneTimeHook{include/#1/end}%
380 <latexrelease> \UseHook{include/end}%
381 <latexrelease> \clearpage
382 <latexrelease> \UseOneTimeHook{include/#1/after}%
383 <latexrelease> \UseHook{include/after}%
384 <latexrelease> \clearpage
385 <latexrelease> \@writeckpt{#1}%
386 <latexrelease> \if@filesw
387 <latexrelease> \immediate\closeout\@partaux
388 <latexrelease> \fi
389 <latexrelease> \else
390 <latexrelease> \deadcycles\z@
391 <latexrelease> \@nameuse{cp@#1}%
392 <latexrelease> \fi
393 <latexrelease> \let\@auxout\@mainaux
394 <latexrelease> \else
395 <latexrelease> \@latex@warning{%
396 <latexrelease> \noexpand\include should only be used after \string\begin{document}}%
397 <latexrelease> \input@{#1}%
398 <latexrelease> \fi}
399 <latexrelease> \NewHook{include/before}
400 <latexrelease> \NewReversedHook{include/end}
401 <latexrelease> \NewReversedHook{include/after}

402 <latexrelease> \IncludeInRelease{0000/00/00}%
403 <latexrelease> {\@include}{Spaces in file names and hooks}%
404 <latexrelease> \def\@include#1 {%
405 <latexrelease> \clearpage
406 <latexrelease> \if@filesw
407 <latexrelease> \immediate\write\@mainaux{\string\input{#1.aux}}%
408 <latexrelease> \fi
409 <latexrelease> \@tempswattrue
410 <latexrelease> \if@partsw
411 <latexrelease> \@tempswafalse
412 <latexrelease> \edef\reserved@b{#1}%
413 <latexrelease> \@for\reserved@a:=\@partlist\do
414 <latexrelease> {\ifx\reserved@a\reserved@b\@tempswattrue\fi}%
415 <latexrelease> \fi
416 <latexrelease> \if@tempswa
417 <latexrelease> \let\@auxout\@partaux
418 <latexrelease> \if@filesw
419 <latexrelease> \immediate\openout\@partaux #1.aux
420 <latexrelease> \immediate\write\@partaux{\relax}%
421 <latexrelease> \fi
422 <latexrelease> \input@{#1.tex}%
423 <latexrelease> \clearpage
424 <latexrelease> \@writeckpt{#1}%
425 <latexrelease> \if@filesw
426 <latexrelease> \immediate\closeout\@partaux
427 <latexrelease> \fi
428 <latexrelease> \else
429 <latexrelease> \deadcycles\z@
430 <latexrelease> \@nameuse{cp@#1}%
431 <latexrelease> \fi

```



```

432 <latexrelease> \let\@auxout\@mainaux}
433 <latexrelease>
434 <latexrelease>\EndIncludeInRelease
435 <*2ekernel>

```

(End definition for \@include.)

\@writeckpt

```

436 \def\@writeckpt#1{%
437   \if@filesw
438     \immediate\write\@partaux{\string\@setckpt{#1}\@charlb}%
439     {\let\@elt\@wckptelt \cl@ckpt}%
440     \immediate\write\@partaux{\@charrb}%
441   \fi}

```

(End definition for \@writeckpt.)

\@wckptelt

```

442 \def\@wckptelt#1{%
443   \immediate\write\@partaux{%
444     \string\setcounter{#1}{\the\@nameuse{c@#1}}}}

```

(End definition for \@wckptelt.)

\@setckpt RmS 93/08/31: introduced \@setckpt

```

445 \def\@setckpt#1{\global\@namedef{cp@#1}}

```

(End definition for \@setckpt.)

\@charlb The following defines \@charlb and \@charrb to be { and }, respectively with \catcode  
\@charrb 11.

```

446 {\catcode' [=1 \catcode']=2
447 \catcode' {=11 \catcode'}=11
448 \gdef\@charlb[{
449 \gdef\@charrb[}]
450 ]% }brace matching

```

(End definition for \@charlb and \@charrb.)

## 1.1 Safe Input Macros

\@curr@file File name handling is done by generating a csname from the provided file name (which  
\set@curr@file means that UTF-8 octets gets turned into strings as this is what happens if they appear  
in a csname due to the code in `utf8.def`). By setting `\escapchar` to -1 we ensure that  
we don't get a backslash in front. As a result we end up with all characters as catcode  
12 (plus spaces). We then sometimes add quotes around the construct (removing any  
existing inner quotes. Sometimes we only remove the quotes if they have been supplied  
by the user. There is clearly some room for improvement.

A side effect of the new code is that we will see quotes around file name displays  
where there haven't been any before.

For compatibility with existing code using `{abc}.tex` or `{one.two}.png`, an initial  
brace group is discarded before expansion and `\string` is applied. The content of the  
brace group is discarded. This means that a leading space will be lost unless protected  
(by `{ }` or `" "` or `\space`) but filenames with a space are hopefully rare.

The definition below is from 2019 and only used during kernel bootstrapping, later on in `ltfilehook.dtx` it will get overwritten.

```

451 \def\set@curr@file#1{%
452   \begingroup
453   \escapechar\m@ne
454   \xdef\@curr@file{%
455     \expandafter\expandafter\expandafter\unquote@name
456     \expandafter\expandafter\expandafter{%
457       \expandafter\string
458       \csname\@firstofone#1\@empty\endcsname}}%
459   \endgroup
460 }
```

(End definition for `\@curr@file` and `\set@curr@file`.)

<code>\quote@name</code>	Quoting spaces
<code>\quote@@name</code>	
<code>\unquote@name</code>	<pre> a b c      -&gt; "a b c" "a b c"    -&gt; "a b c" a" "b" "c -&gt; "a b c"           -&gt; ""</pre>

```

461 </2kernel>
462 <*2kernel | latexrelease>
463 <latexrelease>\IncludeInRelease{2019/10/01}%
464 <latexrelease>          {\quote@name}{Quote file names}%
465 \def\quote@name#1{"\quote@@name#1@gobble""}
466 \def\quote@@name#1"#1\quote@@name}
```

and removing quotes ...

```

467 \def\unquote@name#1{\quote@@name#1@gobble"}
```

(End definition for `\quote@name`, `\quote@@name`, and `\unquote@name`.)

`\IfFileExists`

```

468 \DeclareRobustCommand\IfFileExists[1]{%
469   \set@curr@file{#1}%
470   \expandafter\IfFileExists@\expandafter{\@curr@file}}
```

(End definition for `\IfFileExists`.)

```

471 </2kernel | latexrelease>
472 <latexrelease>\EndIncludeInRelease
473 <latexrelease>\IncludeInRelease{0000/00/00}%
474 <latexrelease>          {\quote@name}{Quote file names}%
475 <latexrelease>
476 <latexrelease>\let\quote@name\@undefined
477 <latexrelease>\let\quote@@name\@undefined
478 <latexrelease>\let\unquote@name\@undefined
479 <latexrelease>
480 <latexrelease>\long\def \IfFileExists#1#2#3{%
481 <latexrelease>   \openin\@inputcheck#1 %
482 <latexrelease>   \ifeof\@inputcheck
483 <latexrelease>     \ifx\input@path\@undefined
484 <latexrelease>       \def\reserved@a{#3}%
485 <latexrelease>     \else
```

```

486 <latexrelease> \def\reserved@a{\@iffileonpath{#1}{#2}{#3}}%
487 <latexrelease> \fi
488 <latexrelease> \else
489 <latexrelease> \closein\@inputcheck
490 <latexrelease> \edef\@filef@und{#1 }%
491 <latexrelease> \def\reserved@a{#2}%
492 <latexrelease> \fi
493 <latexrelease> \reserved@a}
494 <latexrelease>
495 <latexrelease>\EndIncludeInRelease
496 <*2ekernel>

```

`\IfFileExists@` Argument #1 is `\@curr@file` so catcode 12 string with no quotes.

The original definition picked up arguments #2 and #3 in a way that they couldn't contain unbalanced conditionals. A better implementation would have been not to pick up the arguments at all but instead use the usual `\@firstoftwo` and `\@secondoftwo`. However, that changes how # is interpreted and so we can't do that nowadays without invalidating a lot of code. Therefore the somewhat curious construction near the end.

```

497 </2ekernel>
498 <*2ekernel | latexrelease>
499 <latexrelease>\IncludeInRelease{2021/06/01}%
500 <latexrelease> \IfFileExists@{manage unbalanced conditionals}
501 \long\def \IfFileExists@#1#2#3{%
502   \openin\@inputcheck"#1" %
503   \ifeof\@inputcheck
504     \ifx\input@path\@undefined
505       \let\reserved@a\@secondoftwo
506     \else
507       \def\reserved@a{\@iffileonpath{#1}}%
508     \fi
509   \else
510     \closein\@inputcheck
511     \edef\@filef@und{"#1" }%
512     \let\reserved@a\@firstoftwo
513   \fi

```

This is just there so that any # inside #2 or #3 needs doubling (as that was the case in the past).

```

514   \expandafter\def\expandafter\reserved@a
515     \expandafter{\reserved@a{#2}{#3}}%
516 \reserved@a}
517 </2ekernel | latexrelease>
518 <latexrelease>\EndIncludeInRelease
519 <latexrelease>\IncludeInRelease{2019/10/01}%
520 <latexrelease> \IfFileExists@{manage unbalanced conditionals}
521 <latexrelease>
522 <latexrelease>\long\def \IfFileExists@#1#2#3{%
523 <latexrelease> \openin\@inputcheck"#1" %
524 <latexrelease> \ifeof\@inputcheck
525 <latexrelease> \ifx\input@path\@undefined
526 <latexrelease> \def\reserved@a{#3}%
527 <latexrelease> \else
528 <latexrelease> \def\reserved@a{\@iffileonpath{#1}{#2}{#3}}%
529 <latexrelease> \fi

```

```

530 <latexrelease> \else
531 <latexrelease> \closein\@inputcheck
532 <latexrelease> \edef\@filef@und{"#1" }%
533 <latexrelease> \def\reserved@a{#2}%
534 <latexrelease> \fi
535 <latexrelease> \reserved@a}
536 <latexrelease>\EndIncludeInRelease
537 <latexrelease>\IncludeInRelease{0000/00/00}%
538 <latexrelease> {\IfFileExists@}{manage unbalanced conditionals}
539 <latexrelease>
540 <latexrelease>\let\IfFileExists@\@undefined
541 <latexrelease>
542 <latexrelease>
543 <latexrelease>\EndIncludeInRelease
544 <*2ekernel>

```

(End definition for \IfFileExists@.)

**\@iffileonpath** If the file is not found by \openin, and \input@path is defined, look in all the directories specified in \input@path.

```

545 </2ekernel>
546 <*2ekernel | latexrelease>
547 <latexrelease>\IncludeInRelease{2019/10/01}%
548 <latexrelease> {\@iffileonpath}{Quote file names}
549 \long\def\@iffileonpath#1{%
550 \let\reserved@a\@secondoftwo
551 \expandafter\@tfor\expandafter\reserved@b\expandafter
552 : \expandafter=\input@path\do{%
553 \openin\@inputcheck\expandafter\quote@name\expandafter{\reserved@b#1} %
554 \ifeof\@inputcheck\else
555 \edef\@filef@und{\expandafter\quote@name\expandafter{\reserved@b#1} }%
556 \let\reserved@a\@firstoftwo%
557 \closein\@inputcheck
558 \@break@tfor
559 \fi}%
560 \reserved@a}

```

(End definition for \@iffileonpath.)

```

561 </2ekernel | latexrelease>
562 <latexrelease>\EndIncludeInRelease
563 <latexrelease>\IncludeInRelease{0000/00/00}%
564 <latexrelease> {\quote@name}{Quote file names}
565 <latexrelease>
566 <latexrelease>\long\def\@iffileonpath#1{%
567 <latexrelease> \let\reserved@a\@secondoftwo
568 <latexrelease> \expandafter\@tfor\expandafter\reserved@b\expandafter
569 <latexrelease> : \expandafter=\input@path\do{%
570 <latexrelease> \openin\@inputcheck\reserved@b#1 %
571 <latexrelease> \ifeof\@inputcheck\else
572 <latexrelease> \edef\@filef@und{\reserved@b#1 }%
573 <latexrelease> \let\reserved@a\@firstoftwo%
574 <latexrelease> \closein\@inputcheck
575 <latexrelease> \@break@tfor
576 <latexrelease> \fi}%

```

```

577 <latexrelease> \reserved@a}
578 <latexrelease>
579 <latexrelease>\EndIncludeInRelease
580 <*2ekernel>

```

**\InputIfFileExists** Now define `\InputIfFileExists` to input #1 if it seems to exist. Immediately prior to the input, #2 is executed. If the file #1 does not exist, execute ‘#3’.

This here is a temporary definition for the kernel. The real one comes somewhat later in the file `lfilehook.dtx`.

```

581 \DeclareRobustCommand \InputIfFileExists[2]{%
582   \IfFileExists{#1}%
583   {%
584     \expandafter\@swaptwoargs\expandafter
585     {\filef@und}{#2\@addtofilelist{#1}\@input}}

```

*(End definition for \InputIfFileExists.)*

**\@swaptwoargs** Swap two arguments and return them unbraced (like `\@firstoftwo` etc).

```

586 </2ekernel>
587 <*2ekernel | latexrelease>
588 <latexrelease>\IncludeInRelease{2019/10/01}%
589 <latexrelease> {\@swaptwoargs}{Don't lose the file name}%
590 \long\def\@swaptwoargs#1#2{#2#1}
591 </2ekernel | latexrelease>
592 <latexrelease>\EndIncludeInRelease
593 <latexrelease>\IncludeInRelease{0000/00/00}%
594 <latexrelease> {\@swaptwoargs}{Don't lose the file name}%
595 <latexrelease>\let\@swaptwoargs\undefined
596 <latexrelease>\EndIncludeInRelease
597 <*2ekernel>

```

*(End definition for \@swaptwoargs.)*

**\input** Input a file: if the argument is given in braces use safe input macros, otherwise use TeX’s primitive `\input` command (which is called `\@@input` in L<sup>A</sup>T<sub>E</sub>X).

```

598 \def\input{\@ifnextchar\bgroupp\iinput\@@input}

```

*(End definition for \input.)*

**\@iinput** Define `\@iinput` (i.e., `\input`) in terms of `\InputIfFileExists`.

Changes to `\@iinput`: adapt to the changes to `\@missingfileerror`.

```

599 </2ekernel>
600 <*2ekernel | latexrelease>
601 <latexrelease>\IncludeInRelease{2020/10/01}%
602 <latexrelease> {\@iinput}{Change in file error handling}%
603 \def\@iinput#1{%
604   \InputIfFileExists{#1}{}%
605   {\filename@parse\curr@file
606    \edef\reserved@a{\noexpand\@missingfileerror
607     {\filename@area\filename@base}%
608     {\ifx\filename@ext\relax tex\else\filename@ext\fi}}%

```

This line now just sets `\@missingfile@<part>`:

```

609   \reserved@a

```

Now here we have to use it. The file here is guaranteed to exist, because `\@missingfileerror` ensures so, but we have to use `\InputIfFileExists` because it executes the file hooks.

```

610 \edef\reserved@a{\noexpand\@input{%
611   \@missingfile@area\@missingfile@base.\@missingfile@ext}}%
612 \reserved@a}}
613 </2ekernel|latexrelease>
614 <latexrelease>\EndIncludeInRelease

615 <latexrelease>\IncludeInRelease{2019/10/01}%
616 <latexrelease>      {\@input}{Quote file names}%
617 <latexrelease>
618 <latexrelease>\def\@input#1{%
619   <latexrelease> \InputIfFileExists{#1}{}%
620   <latexrelease> {\filename@parse\@curr@file
621   <latexrelease> \edef\reserved@a{\noexpand\@missingfileerror
622   <latexrelease>   {\filename@area\filename@base}%
623   <latexrelease>   {\ifx\filename@ext\relax tex\else\filename@ext\fi}}%
624   <latexrelease> \reserved@a}}
625 <latexrelease>\EndIncludeInRelease

626 <latexrelease>\IncludeInRelease{0000/00/00}%
627 <latexrelease>      {\@input}{Quote file names}%
628 <latexrelease>\def\@input#1{%
629   <latexrelease> \InputIfFileExists{#1}{}%
630   <latexrelease> {\filename@parse{#1}%
631   <latexrelease> \edef\reserved@a{\noexpand\@missingfileerror
632   <latexrelease>   {\filename@area\filename@base}%
633   <latexrelease>   {\ifx\filename@ext\relax tex\else\filename@ext\fi}}%
634   <latexrelease> \reserved@a}}
635 <latexrelease>\EndIncludeInRelease
636 <*2ekernel>

```

*(End definition for \@input.)*

**\@input** Define `\@input` in terms of `\IfFileExists`. So this is a ‘safe input’ command, but the files input are not listed by `\listfiles`.

We don’t want `.aux`, `.toc` files etc be listed by `\listfiles`. However, something like `.bbl` probably should be listed and thus should be implemented not by `\@input`.

```

637 \def\@input#1{%
638   \IfFileExists{#1}{\@input\@filef@und}{\typeout{No file #1.}}

```

*(End definition for \@input.)*

**\@input@** Version of `\@input` that does add the file to `\@filelist`.

```

639 \def\@input@#1{\InputIfFileExists{#1}{}{\typeout{No file #1.}}}

```

*(End definition for \@input@.)*

**\@missingfileerror** This ‘error’ command avoids T<sub>E</sub>X’s primitive missing file loop.

Missing file error. Prompt for a new filename, offering a default extension.

Changes to `\@missingfileerror`: rather than trying to input the file by force, now `\@missingfileerror` just returns three `\@missingfile@<part>` and the caller macro is responsible for doing the right thing with it.

```

640 </2ekernel>
641 <*2ekernel|latexrelease>

```

```

642 <latexrelease>\IncludeInRelease{2020/10/01}%
643 <latexrelease>      {\@missingfileerror}{Do not load missing file immediately}%
644 \gdef\@missingfileerror#1#2{%
645   \typeout{^^J! LaTeX Error: File ‘#1.#2’ not found.^^J^^J%
646   Type X to quit or <RETURN> to proceed,^^J%
647   or enter new name. (Default extension: #2)^^J}%
648   \message{Enter file name: }%
649   {\endlinechar\m@ne
650   \global\read\m@ne to\@gtempa}%
651   \ifx\@gtempa\@empty

```

If the user answers with *<return>*, fallback to the .tex file (previously it did nothing).

```

652   \let\@missingfile@area\@empty
653   \let\@missingfile@base\@empty
654   \def\@missingfile@ext{tex}%
655   \else

```

Use `\batchmode\read-1 to <tl>` to end the T<sub>E</sub>X run, same as `expl3` does (it was `\batchmode\@@end` before).

```

656   \def\reserved@b{\batchmode\read-1 to \reserved@a}%
657   \def\reserved@a{x}\ifx\reserved@a\@gtempa\reserved@b\fi
658   \def\reserved@a{X}\ifx\reserved@a\@gtempa\reserved@b\fi
659   \filename@parse\@gtempa
660   \edef\filename@ext{%
661     \ifx\filename@ext\relax#2\else\filename@ext\fi}%
662   \edef\reserved@a{%

```

Only check `\IfFileExists` (it was `\InputIfFileExists`).

```

663   \noexpand\IfFileExists
664     {\filename@area\filename@base.\filename@ext}%

```

If the file exists, define `\@missingfile@<part>`.

```

665     {\def\noexpand\@missingfile@area{\filename@area}%
666     \def\noexpand\@missingfile@base{\filename@base}%
667     \def\noexpand\@missingfile@ext {\filename@ext}}%
668     {\noexpand\@missingfileerror
669     {\filename@area\filename@base}{\filename@ext}}}%
670   \reserved@a
671   \fi
672 }
673 </2ekernel | latexrelease>
674 <latexrelease>\EndIncludeInRelease

675 <latexrelease>\IncludeInRelease{0000/00/00}%
676 <latexrelease>      {\@missingfileerror}{Do not load missing file immediately}%
677 <latexrelease>
678 <latexrelease>\gdef\@missingfileerror#1#2{%
679 <latexrelease>      \typeout{^^J! LaTeX Error: File ‘#1.#2’ not found.^^J^^J%
680 <latexrelease>      Type X to quit or <RETURN> to proceed,^^J%
681 <latexrelease>      or enter new name. (Default extension: #2)^^J}%
682 <latexrelease>      \message{Enter file name: }%
683 <latexrelease>      {\endlinechar\m@ne
684 <latexrelease>      \global\read\m@ne to\@gtempa}%
685 <latexrelease>      \ifx\@gtempa\@empty
686 <latexrelease>      \else
687 <latexrelease>      \def\reserved@a{x}\ifx\reserved@a\@gtempa\batchmode\@@end\fi

```

```

688 <latexrelease> \def\reserved@a{X}\ifx\reserved@a\@gtempa\batchmode\@end\fi
689 <latexrelease> \filename@parse\@gtempa
690 <latexrelease> \edef\filename@ext{%
691 <latexrelease> \ifx\filename@ext\relax#2\else\filename@ext\fi}%
692 <latexrelease> \edef\reserved@a{%
693 <latexrelease> \noexpand\InputIfFileExists
694 <latexrelease> {\filename@area\filename@base.\filename@ext}%
695 <latexrelease> {}%
696 <latexrelease> {\noexpand\@missingfileerror
697 <latexrelease> {\filename@area\filename@base}{\filename@ext}}}%
698 <latexrelease> \reserved@a
699 <latexrelease> \fi}
700 <latexrelease>
701 <latexrelease>\EndIncludeInRelease
702 <*2ekernel>

```

(End definition for \@missingfileerror.)

**\@obsoletefile** For compatibility with L<sup>A</sup>T<sub>E</sub>X 2.09 document styles, we distribute files called `article.sty`, `book.sty`, `report.sty`, `slides.sty` and `letter.sty`. These use the command `\@obsoletefile`, which produces a warning message.

```

703 \def\@obsoletefile#1#2{%
704 \latex@warning@no@line{inputting ‘#1’ instead of obsolete ‘#2’}}
705 \onlypreamble\@obsoletefile

```

## 1.2 Listing files

**\@filelist** A list of files input so far. The initial value of `\@gobble` eats the comma before the first file name.

```

706 \let\@filelist\@gobble

```

**\@addtofilelist** Add to the list of files input so far. This ‘real’ definition is only used for ‘cfg’ files during initex. An initial definition of `\@gobble` has already been set.

```

707 %\def\@addtofilelist#1{\xdef\@filelist{\@filelist,#1}}

```

A preamble command to cause `\end{document}` to list files input from the main file.

```

\listfiles
708 \def\listfiles{%
709 \let\listfiles\relax
710 \def\@listfiles##1##2##3##4##5##6##7##8##9\@{%
711 \def\reserved@d{\}%
712 \@tfor\reserved@c:=##1##2##3##4##5##6##7##8\do{%
713 \ifx\reserved@c\reserved@d
714 \edef\filename@area{ \filename@area}%
715 \fi}}%

716 \def\@dofilelist{%
717 \typeout{^^J *File List*}%
718 \@for\@currname:=\@filelist\do{%
719 \filename@parse\@currname
720 \edef\reserved@a{%
721 \filename@base.%
722 \ifx\filename@ext\relax tex\else\filename@ext\fi}%
723 \expandafter\let\expandafter\reserved@b
724 \csname ver@\reserved@a\endcsname

```



Packages that `\relax` their `\ver@...` string to allow for multiple loading (e.g., `fontenc`) can use `\ver@@...` to store the version information instead.

```

725     \ifx\reserved@b\relax
726         \expandafter\let\expandafter\reserved@b
727             \csname ver@@\reserved@a\endcsname
728     \fi
729     \expandafter\expandafter\expandafter\@listfiles\expandafter
730         \filename@area\filename@base\////////////////////////////////\@@
731     \typeout{%
732         \filename@area\reserved@a
733         \ifx\reserved@b\relax\else\@spaces\reserved@b\fi}}%
734     \typeout{ *****^~J}}

```

The `\@filelist` will be de-activated if `\listfiles` does not appear in the preamble. `\begin{document}` contains code equivalent to the following:

```

\AtBeginDocument{%
    \ifx\@listfiles\@undefined
        \let\@filelist\relax
        \let\@addtofilelist\@gobble
    \fi}

735 \@onlypreamble\listfiles

```

```

\@dofilelist 736 \let\@dofilelist\relax

737 \</2ekernel>

```

*(End definition for \obsoletefile and others.)*

File s

# ltoutenc.dtx

## 1 Font encodings

This section of the kernel contains commands for declaring encoding-specific commands, such as accents. It also contains the code for some of the encoding files, including `omlenc.def`, `omsenc.def`, `t1enc.def` and `ot1enc.def` files, which define the OML, OMS, T1 and OT1 encodings, and the `fontenc` package for selecting encodings.

The `fontenc` package has options for encodings, of which the last option is the default encoding. For example, to use the OT2, OT3 and T1 encodings, with T1 as the default, you say:

```
\usepackage[OT2,OT3,T1]{fontenc}
```

The standard kernel set-up loads font encoding files and selects an encoding as follows.

```
\input {omlenc.def}
\input {t1enc.def}
\input {ot1enc.def}
\input {omsenc.def}
\fontencoding{OT1}
```

Note that the files in the standard `inputenc` package depend on this behaviour of the kernel.

The syntax for declaring encoding-specific commands is:

```
\DeclareTextCommand{<command>}{<encoding>}
                               [<number>] [<default>]{<commands>}
```

This command is like `\newcommand`, except that it defines a command which is specific to one encoding. The resulting command is always robust, even if its definition is fragile. For example, the definition of `\l` in the OT1 encoding is:

```
\DeclareTextCommand{\l}{OT1}{\@xxxii l}
```

`\DeclareTextCommand` takes the same optional arguments as `\newcommand`.

```
\ProvideTextCommand{<command>}{<encoding>}
                               [<number>] [<default>]{<commands>}
```

This acts like `\DeclareTextCommand`, but does nothing if the command is already defined.

```
\DeclareTextSymbol{<command>}{<encoding>}{<slot>}
```

This command defines a text symbol, with a particular slot in that encoding. The commands:

```
\DeclareTextSymbol{\ss}{OT1}{25}
\DeclareTextCommand{\ss}{OT1}{\char25 }
```

have the same effect, but the `\DeclareTextSymbol` is faster.

```
\DeclareTextAccent{<command>}{<encoding>}{<slot>}
```

This command declares a text accent. The commands:

```
\DeclareTextAccent{"}{OT1}{127}
\DeclareTextCommand{"}{OT1}{\add@accent {127}}
```

have the same effect.

```
\DeclareTextComposite{<command>}
                               {<encoding>}{<argument>}{<slot>}
```

This command declares a composite letter, for example in the T1 encoding `\'a` is slot 225, which is declared by:

```
\DeclareTextComposite{\'}{T1}{a}{225}
```

The *command* will normally have been declared with `\DeclareTextAccent`, or as a one-argument `\DeclareTextCommand`.

`\DeclareTextComposite` is the most common example of using the more general declaration `\DeclareTextCompositeCommand`, which can define a composite to be an arbitrary piece of text.

```
\DeclareTextCompositeCommand{<command>}
                               {<encoding>}{<argument>}{<text>}
```

For example, in the OT1 encoding Å has a hand-crafted definition this is declared as follows

```
\DeclareTextCompositeCommand{\r}{OT1}{A}
{\leavevmode\setbox\z@\hbox{!}\dimen@ht\z@\advance\dimen@-1ex%
 \rlap{\raise.67\dimen@\hbox{\char23}}A}
```

The *command* will normally have been declared with `\DeclareTextAccent`, or as a one-argument `\DeclareTextCommand`.

The commands defined using the above declarations can be used in two ways. Normally they are used by just calling the command in the appropriate encoding, for example `\ss`. However, sometimes you may wish to use a command in an encoding where it is not defined. If the command has no arguments, then you can use it in another encoding by calling `\UseTextSymbol`:

```
\UseTextSymbol{<encoding>}{<command>}
```

For example, `\UseTextSymbol{OT1}{\ss}` has the same effect as:

```
{\fontencoding{OT1}\selectfont\ss}
```

If the command has one argument then you can use it in another encoding by calling `\UseTextAccent`:

```
\UseTextAccent{<encoding>}{<command>}{<text>}
```

For example, if the current encoding is OT2 then `\UseTextAccent{OT1}{\'}{a}` has the same effect as:

```
{\fontencoding{OT1}\selectfont\'{\fontencoding{OT2}\selectfont a}}
```

You can also declare a default definition for a text command, which will be used if the current encoding has no appropriate definition. Such use will also set the definition for this command in the current encoding to equal this default definition; this makes subsequent uses of the command much faster.

```
\DeclareTextCommandDefault{<command>}{<definition>}
```

For example, the default definition of the command `\textonequarter` (which produces the fraction  $\frac{1}{4}$ ) could be built using math mode:

```
\DeclareTextCommandDefault{\textonequarter}{\ensuremath {\frac{1}{4}}}
```

There is a matching `\Provide` command which will not override an existing default definition:

```
\ProvideTextCommandDefault{<command>}{<definition>}
```

The most common use for these commands is to use symbols from other encodings, so there are some optimizations provided:

```
\DeclareTextSymbolDefault{<command>}{<encoding>}
\DeclareTextAccentDefault{<command>}{<encoding>}
```

are short for:

```
\DeclareTextCommandDefault{<command>}
      {\UseTextSymbol{<encoding>}{<command>}}
\DeclareTextCommandDefault[1]{<command>}
      {\UseTextAccent{<encoding>}{<command>}{#1}}
```

For example, to make OT1 the default encoding for `\ss` and `\'` you say:

```
\DeclareTextSymbolDefault{\ss}{OT1}
\DeclareTextAccentDefault{\'}{OT1}
```

Note that you can use these commands on any zero- or one-argument commands declared with `\DeclareText*` or `\ProvideText*`, not just those defined using `\DeclareTextSymbol` or `\DeclareTextAccent`.

## 1.1 Removing encoding-specific commands

In some cases encoding definitions are given to provide some limited support since nothing better is available, for example, the definition for `\textdollar` in OT1 is a hack since \$ and £ actually share the same slot in this encoding. Thus if such a glyph becomes available in a different encoding (e.g., TS1) one would like to get rid of the flaky one and make the default definition point to the new encoding. In such a case defining

```
\DeclareTextSymbol{\textdollar}{TS1}{36}
\DeclareTextSymbolDefault{\textdollar}{TS1}
```

is not enough since if typesetting in OT1 L<sup>A</sup>T<sub>E</sub>X will still find the encoding specific-definition for OT1 and therefore ignore the new default. Therefore to ensure that in this case the TS1 version is used we have to remove the OT1 declaration:

```
\UndeclareTextCommand{\textdollar}{OT1}
```

Since the \$ sign is a proper glyph in the T1 encoding there is no point removing its definition and forcing L<sup>A</sup>T<sub>E</sub>X to pick up the TS1 version if typesetting in this encoding. However, assume you want to use the variant dollar sign, i.e., \$ for your dollars. In that case you have to get rid of the T1 declaration as well, e.g., the following would do that for you:

```
\UndeclareTextCommand{\textdollar}{OT1}
\UndeclareTextCommand{\textdollar}{T1}
\DeclareTextCommandDefault{\textdollar}
{\UseTextSymbol{TS1}\textdollaroldstyle}
```

## 1.2 The order of declarations

If an encoding-specific command is defined for more than one encoding, then it will execute fastest in the encoding in which it was defined last since its top-level definition will be set up to execute in that encoding without any overhead.

For this reason the file `fonttext.ltx` currently first loads the definitions for the T1 encoding and then those for the OT1 encoding so that typesetting in OT1 is optimized since that is (still) the default. However, when T1 is explicitly requested (via `\usepackage[T1]{fontenc}`) the top-level definitions are automatically changed to favour T1 since its declarations are reloaded in the process.

For the same reason default declarations should never come last since they are implemented as a special encoding themselves (with the name ?). Specifying them last would simply mean to make those encoding-specific commands equally inefficient in all encodings. Therefore the `textcomp` package, for example, first sets up all defaults to point to TS1 and then declares the commands in the TS1 encoding.

## 1.3 Docstrip modules

This `.dtx` file is be used to generate several related files containing font encoding definitions. The mutually exclusive docstrip options are listed here.

T1	generates <code>t1enc.def</code> for the Cork encoding.
TS1	generates <code>ts1enc.def</code> for the Text Companion encoding.
TS1sty	generates <code>textcomp.sty</code> , package that sets up use of the Text Companion encoding.
OT1	generates <code>ot1enc.def</code> for Knuth's CM encoding.
OMS	generates <code>omsenc.def</code> for Knuth's math symbol encoding.
OML	generates <code>omlenc.def</code> for Knuth's math letters encoding.
OT4	generates <code>ot4enc.def</code> for the Polish extension to the OT1 encoding, created by B. Jackowski and M. Ryćko for use with the Polish version of Computer Modern and Computer Concrete.
TU	generates <code>tuenc.def</code> for Unicode font encoding.
package	generates <code>fontenc.sty</code> for selecting encodings.
2ekernel	for the kernel commands.

## 1.4 Definitions for the kernel

### 1.4.1 Declaration commands

This section contains definitions for commands such as accents which depend on the current encoding. These commands will usually be kept in `.def` files, for example `ot1enc.def` contains the definitions for the OT1 encoding.

```
1 <*2ekernel>
2 \message{font encodings,}

Far too many macros in one block here!
```

```
\DeclareTextCommand
\ProvideTextCommand
\DeclareTextSymbol
  \@dec@text@cmd
\chardef@text@cmd
  \@changed@cmd
  \@changed@x
\TextSymbolUnavailable
  \@inmathwarn

If you say:
  \DeclareTextCommand{\foo}{T1}...

then \foo is defined to be \T1-cmd \foo \T1\foo, where \T1\foo is one control sequence, not two! We then call \newcommand to define \T1\foo.

3 \def\DeclareTextCommand{%
4   \@dec@text@cmd\newcommand}
5 \def\ProvideTextCommand{%
6   \@dec@text@cmd\providecommand}
7 \def\@dec@text@cmd#1#2#3{%
8   \expandafter\def\expandafter#2%
9     \expandafter{%
10      \csname#3-cmd\expandafter\endcsname
11      \expandafter#2%
12      \csname#3\string#2\endcsname
13    }%
14   \let\@ifdefinable\@rc@ifdefinable
15   \expandafter#1\csname#3\string#2\endcsname}
```

This command was introduced to fix a major bug in `\@dec@text@cmd` without changing that command itself. This was thought to be necessary because it is defined in more than one package. (Perhaps the more serious bug is to put complex low-level commands like this in packages?)

The problem it solves is that whereas both `\newcommand` and `\providecommand` (used just above) both handle the resetting of `\@ifdefinable` (following its disabling in `\@dec@text@cmd`), the primitive `\chardef` neither needs the disabling, nor does the resetting.

```
16 \def\chardef@text@cmd{%
17   \let\@ifdefinable\@@ifdefinable
18   \chardef
19 }
20 \def\DeclareTextSymbol#1#2#3{%
21   \@dec@text@cmd\chardef@text@cmd#1{#2}#3\relax
22 }
```

The declarations are only available before `\begin{document}`.

```
23 \@onlypreamble\DeclareTextCommand
24 \@onlypreamble\DeclareTextSymbol
```

The sneaky bit in all this is what `\T1-cmd \foo \T1\foo` does. There are five possibilities, depending on the current values of `\protect`, `\cf@encoding` and `\ifmmode`:

- If `\protect` is `\@typeset@protect` and `\cf@encoding` is T1, then we execute `\T1\foo`. This should be the normal behaviour, and is optimized for speed.
- If `\protect` is `\@typeset@protect`, `\cf@encoding` is (say) OT1, and `\OT1\foo` is defined, then we execute `\OT1\foo`.
- If `\protect` is `\@typeset@protect`, `\cf@encoding` is (say) OT1, we're in text mode, and `\OT1\foo` is undefined, then we define `\OT1\foo` to be the default value of `\foo`, and execute `\OT1\foo`.
- If `\protect` is `\@typeset@protect`, `\cf@encoding` is (say) OT1, we're in math mode, and `\OT1\foo` is undefined, then we execute the default value of `\foo`. (This is necessary so that things like `$X_\copyright$` work properly.)
- If `\protect` is not `\@typeset@protect` then we execute `\noexpand\foo`. For example, if we are writing to a file, then this results in `\foo` being written. If we are in a `\mark`, then `\foo` will be put in the mark—since `\foo` is robust, it will then survive all the things which may happen to it whilst it's a `\mark`.

So after all that, we will either execute the appropriate definition of `\foo` for the current encoding, or we will execute `\noexpand\foo`.

The default value of `\foo` is `\?\foo` if it is defined, and an error message otherwise.

When the encoding is changed from T1 to OT1, `\T1-cmd` is defined to be `\@changed@cmd` and `\OT1-cmd` is defined to be `\@current@cmd`. This means that the test for what the current encoding is can be performed quickly.

```

25 \def\@current@cmd#1{%
26     \ifx\protect\@typeset@protect
27         \@inmathwarn#1%
28     \else
29         \noexpand#1\expandafter\@gobble
30     \fi}

31 \def\@changed@cmd#1#2{%
32     \ifx\protect\@typeset@protect
33         \@inmathwarn#1%
34         \expandafter\ifx\csname\cf@encoding\string#1\endcsname\relax
35             \expandafter\ifx\csname ?\string#1\endcsname\relax
36                 \expandafter\def\csname ?\string#1\endcsname{%
37                     \TextSymbolUnavailable#1%
38                 }%
39             \fi
40             \global\expandafter\let
41                 \csname\cf@encoding\string#1\expandafter\endcsname
42                 \csname ?\string#1\endcsname
43             \fi
44             \csname\cf@encoding\string#1%
45                 \expandafter\endcsname
46     \else
47         \noexpand#1%
48     \fi}

49 \gdef\TextSymbolUnavailable#1{%
50     \@latex@error{%
51         Command \protect#1 unavailable in encoding \cf@encoding%
52     }\@eha}

```

The command `\@inmathwarn` produces a warning message if we are currently in math mode. Note that since this command is used inside text commands, it can't call `\relax` before the `\ifmmode`. This means that it is possible for the warning to fail to be issued at the beginning of a row of an `halign` whose template enters math mode. This is probably a bad feature, but there's not much that can be done about it, since adding a `\relax` would break ligatures and kerning between text symbols.

A more efficient solution would be to make `\@inmathwarn` and `\@inmatherr` equal to `\@empty` and `\relax` by default, and to have `\everymath` reset them to their usual definitions. This is left for future investigation (for example it may break some third party code).

```
53 \def\@inmathwarn#1{%
54   \ifmmode
55     \@latex@warning{Command \protect#1 invalid in math mode}%
56   \fi}
```

*(End definition for \DeclareTextCommand and others.)*

`\DeclareTextCommandDefault`  
`\ProvideTextCommandDefault`

These define commands with encoding ?.

Note that `\DeclareTextCommandDefault` can only be used in the preamble, but that the `\Provide` version is allowed in inputenc .def files, so is allowed anywhere.

```
57 \def\DeclareTextCommandDefault#1{%
58   \DeclareTextCommand#1?}

59 \def\ProvideTextCommandDefault#1{%
60   \ProvideTextCommand#1?}

61 \@onlypreamble\DeclareTextCommandDefault
62 %\@onlypreamble\ProvideTextCommandDefault
```

They require `\? -cmd` to be initialized as `\@changed@cmd`.

```
63 \expandafter\let\csname?-cmd\endcsname\@changed@cmd
```

*(End definition for \DeclareTextCommandDefault and \ProvideTextCommandDefault.)*

`\DeclareTextAccent`

This is just a disguise for defining a T<sub>E</sub>X `\accent` command.

```
64 \def\DeclareTextAccent#1#2#3{%
65   \DeclareTextCommand#1{#2}{\add@accent{#3}}}

66 \@onlypreamble\DeclareTextAccent
```

*(End definition for \DeclareTextAccent.)*

`\add@accent`

To save space this code is shared between all text accents that are set using the `\accent` primitive. The argument is pre-set in a box so that any font loading that is needed is already done within the box. This is needed because font-loading involves grouping and that would prevent the accent mechanism from working so that the accent would not be positioned over the argument. Declarations that change the font should be allowed (only low-level ones are at present) inside the argument of an accent command, but not size changes, as they involve `\setbox` operations which also inhibit the mechanism of the `\accent` primitive.

Note that the whole process is within a group. For a detailed discussion of this reimplementaion and its deficiencies, see pr/3160.

```
67 \def\add@accent#1#2{\hmode@bgroup
```



Turn off the group in `\UseTextSymbol` in case this is used inside the argument of `\add@accent`.

```
68 \let\hmode@start@before@group\@firstofone
69 \setbox\@tempboxa\hbox{#2}
```

When presetting the argument in a box we record its `\spacefactor` for later use after the accent got typeset. This way something like `\‘A` gets the spacefactor of `A` (i.e., 999) rather than the default value of 1000.

```
70 \global\mathchardef\accent@spacefactor\spacefactor}%
```

The accent primitive doesn't allow things `\begingroup` to interfere between accent and base character. Therefore we need to avoid that (they are some hidden inside `\maybe@load@fontshape`). As we don't have to load the fontshape in this case (as that happened in the box above if necessary, we simply disable that part of the code temporarily. We also ignore `\ignorespaces` which has the same issue and may show up as part of `\normalfont` if that is used.

```
71 \let\maybe@load@fontshape\relax
72 \let\ignorespaces\relax
73 \accent#1 #2\egroup\ifmmode\else\spacefactor\accent@spacefactor\fi}
```

Default definition for `\accent@spacefactor` prevents a horrible death of the above macro inside an unprotected `\edef`.

```
74 \let\accent@spacefactor\relax
```

(End definition for `\add@accent`.)

`\hmode@bgroup`

```
75 \def\hmode@bgroup{\leavevmode\bgroup}
```

(End definition for `\hmode@bgroup`.)

`\DeclareTextCompositeCommand` Another amusing game to play with `\expandafter`, `\csname`, and `\string`. When you say `\DeclareTextCompositeCommand{\foo}{T1}{a}{bar}`, we look to see if the expansion of `\T1\foo` begins with `\@text@composite`, and if it doesn't, we redefine `\T1\foo` to be:

```
\@text@composite
\@text@composite@x
\@strip@args
#1 -> \@text@composite \T1\foo #1\@empty \@text@composite {...}
```

where `...` is the previous definition of `\T1\foo`. Finally, we define `\T1\foo-a` to expand to `bar`.

```
76 </2kernel>
77 <latexrelease>\IncludeInRelease{2017/04/15}{\DeclareTextCompositeCommand}
78 <latexrelease> {test for undeclared accent}%
79 <*2kernel | latexrelease>
80 \def\DeclareTextCompositeCommand#1#2#3#4{%
81 \expandafter\let\expandafter\reserved@a\csname#2\string#1\endcsname
82 \ifx\reserved@a\relax
83 \DeclareTextCommand#1{#2}{%
84 \@latex@error{\string#1 undeclared in encoding #2}\@eha}%
85 \@latex@info{Composite with undeclared \string#1 in encoding #2}%
86 \expandafter\let\expandafter\reserved@a\csname#2\string#1\endcsname
87 \fi
88 \expandafter\expandafter\expandafter\ifx
89 \expandafter\@car\reserved@a\relax\relax\@nil \@text@composite \else
90 \edef\reserved@b##1{%
```

```

91         \def\expandafter\noexpand
92         \csname#2\string#1\endcsname###1{%
93         \noexpand\@text@composite
94         \expandafter\noexpand\csname#2\string#1\endcsname
95         ###1\noexpand\@empty\noexpand\@text@composite
96         {##1}}}%
97     \expandafter\reserved@b\expandafter{\reserved@a{##1}}%
98 \fi
99 \expandafter\def\csname\expandafter\string\csname
100     #2\endcsname\string#1-\string#3\@empty\endcsname{##1}%
101 }
102 </2ekernel | latexrelease>
103 <latexrelease>\EndIncludeInRelease
104 <latexrelease>\IncludeInRelease{0000/00/00}{\DeclareTextCompositeCommand}
105 <latexrelease>                                     {test for undeclared accent}%
106 <latexrelease>\def\DeclareTextCompositeCommand#1#2#3#4{%
107 <latexrelease> \expandafter\let\expandafter\reserved@a
108 <latexrelease>                                     \csname#2\string#1\endcsname
109 <latexrelease> \expandafter\expandafter\expandafter\ifx
110 <latexrelease> \expandafter\@car\reserved@a\relax\relax\@nil
111 <latexrelease>                                     \@text@composite \else
112 <latexrelease> \edef\reserved@b##1{%
113 <latexrelease> \def\expandafter\noexpand
114 <latexrelease> \csname#2\string#1\endcsname###1{%
115 <latexrelease> \noexpand\@text@composite
116 <latexrelease> \expandafter\noexpand\csname#2\string#1\endcsname
117 <latexrelease> ###1\noexpand\@empty\noexpand\@text@composite
118 <latexrelease> {##1}}}%
119 <latexrelease> \expandafter\reserved@b\expandafter{\reserved@a{##1}}%
120 <latexrelease> \fi
121 <latexrelease> \expandafter\def\csname\expandafter\string\csname
122 <latexrelease>     #2\endcsname\string#1-\string#3\@empty\endcsname{##1}}
123 <latexrelease>\EndIncludeInRelease
124 <*2ekernel>
125 \@onlypreamble\DeclareTextCompositeCommand

```

This all works because:

```
\@text@composite \T1\foo A\@empty \@text@composite {...}
```

expands to `\T1\foo-A` if `\T1\foo-A` has been defined, and `{...}` otherwise.

Note that `\@text@composite` grabs the first token of the argument and puts just that in the csname. This is so that `\'\{ \textit{e} \}` will work—it checks whether `\T1\'-\textit` is defined (which presumably it isn't) and so expands to `\{ \accent 1 \textit{e} \}`.

This trick won't always work, for example `\'\{ \itshape e \}` will expand to (with spaces added for clarity):

```
\csname \string \T1\' - \string { \itshape e } \@empty \endcsname
```

which will die pretty horribly. Unfortunately there's not much can be done about this if we're going to use `\csname` lookups as a fast way of accessing composites.

This has an unfortunate 'misfeature' though, which is that in the T1 encoding, `\'\{aa\}` produces á. This is not the expected behaviour, and should perhaps be fixed if the fix doesn't affect performance too badly.

Finally, it's worth noting that the `\@empty` is used in `\@text@composite` so that accents will work even when the argument is empty. If you say `\'{}`  then this looks up `\T1\'-\@empty`, which ought to be `\relax`, and so all is well. If we didn't include the `\@empty`, then `\'{}`  would expand to:

```
\csname \string \T1\' - \string \endcsname
```

so the `\endcsname` would be `\string'ed` and the whole of the rest of the document would be put inside the `\csname`. This would not be good.

```
126 \def\@text@composite#1#2#3\@text@composite{%
127   \expandafter\@text@composite@x
128     \csname\string#1-\string#2\endcsname}
```

Originally the `\@text@composite@x` macro had two arguments and if `#1` was not `\relax` it was executed, otherwise `#2` was executed. All this happened within the `\ifx` code so that neither `#1` nor `#2` could have picked up any additional arguments from the input stream. This has now been changed using the typical `\@firstoftwo / \@secondoftwo` coding. This way the final expansion will happen without any `\else` or `\fi` intervening in the case that we need to get a further token from the input stream.

```
129 \def\@text@composite@x#1{%
130   \ifx#1\relax
131     \expandafter\@secondoftwo
132   \else
133     \expandafter\@firstoftwo
134   \fi
135   #1}
```

The command `\DeclareTextComposite` uses `\DeclareTextCompositeCommand` to declare a command which expands out to a single glyph.

```
136 \catcode\z@=11\relax
137 \def\DeclareTextComposite#1#2#3#4{%
138   \def\reserved@a{\DeclareTextCompositeCommand#1{#2}{#3}}%
139   \bgroup
140     \lccode\z@#4%
141     \lowercase{%
142   \egroup
143     \reserved@a ^^@}}
144 \catcode\z@=15\relax
145 \@onlypreamble\DeclareTextComposite
(End definition for \DeclareTextCompositeCommand and others.)
146 </2ekernel>
147 <*2ekernel | latexrelease>
148 <latexrelease>\IncludeInRelease{2019/10/01}%
149 <latexrelease>          {\UseTextAccent}{Make commands robust}}%
```

`\UseTextAccent` These fragile commands access glyphs from different encodings. They use grotty low-level calls to the font selection scheme for speed, and in order to make sure that `\UseTextSymbol` doesn't do anything which you're not allowed to do between an `\accent` and its glyph.

`\@use@text@encoding`

For a detailed discussion of this reimplementaion and its deficiencies, see pr/3160.

```

150 \DeclareRobustCommand*\UseTextAccent[3]{%
151   \hmode@start@before@group
152   {%

```

Turn off the group in `\UseTextSymbol` in case this is used inside the arguments of `\UseTextAccent`.

```

153   \let\hmode@start@before@group\@firstofone
154   \let\@curr@enc\cf@encoding
155   \@use@text@encoding{#1}%
156   #2{\@use@text@encoding\@curr@enc#3}%
157   }}

158 \DeclareRobustCommand*\UseTextSymbol[2]{%
159   \hmode@start@before@group
160   {%
161     \def\@wrong@font@char{\MessageBreak
162       for \noexpand\symbol'\string#2'}%
163     \@use@text@encoding{#1}%
164     #2%
165   }%
166   }

167 </2ekernel | latexrelease>
168 <latexrelease>\EndIncludeInRelease
169 <latexrelease>\IncludeInRelease{0000/00/00}%
170 <latexrelease>          {\UseTextAccent}{Make commands robust}%
171 <latexrelease>
172 <latexrelease>\kernel@make@fragile\UseTextAccent
173 <latexrelease>\kernel@make@fragile\UseTextSymbol
174 <latexrelease>
175 <latexrelease>\EndIncludeInRelease
176 <*2ekernel>

```

Switch to a different text encoding without any grouping for use in `\UseTextAccent` or `\UseTextSymbol` (and for `\oldstylenums`).

```

177 \def\@use@text@encoding#1{%
178   \edef\f@encoding{#1}%
179   \xdef\font@name{%
180     \csname\curr@fontshape/\f@size\endcsname}%
181   \pickup@font
182   \font@name
183   \@@enc@update}

```

*(End definition for `\UseTextAccent`, `\UseTextSymbol`, and `\@use@text@encoding`.)*

`\hmode@start@before@group` The `\hmode@start@before@group` starts hmode and should be immediately followed by an explicit `{...}`. Its purpose is to ensure that hmode is started before this group is opened. Inside `\add@accent` and `\UseTextAccent` it is redefined to remove this group so that it doesn't conflict with the `\accent` primitive.

For a detailed discussion see pr/3160.

```

184 \let\hmode@start@before@group\leavevmode

```

*(End definition for `\hmode@start@before@group`.)*

`\DeclareTextSymbolDefault` Some syntactic sugar. Again, these should probably be optimized for speed.

```
\DeclareTextAccentDefault
185 \def\DeclareTextSymbolDefault#1#2{%
186   \DeclareTextCommandDefault#1{\UseTextSymbol{#2}#1}}
187 \def\DeclareTextAccentDefault#1#2{%
188   \DeclareTextCommandDefault#1{\UseTextAccent{#2}#1}}
189 \@onlypreamble\DeclareTextSymbolDefault
190 \@onlypreamble\DeclareTextAccentDefault
```

*(End definition for \DeclareTextSymbolDefault and \DeclareTextAccentDefault.)*

`\UndeclareTextCommand` This command safely removes an encoding specific declaration for a given encoding. It is helpful if one intends to use the default definition always and therefore wants to get rid of a declaration for some specific encoding.

```
191 \def\UndeclareTextCommand#1#2{%
If there is no declaration for the current encoding do nothing. (This makes a hash table
entry but without eTeX we can't do anything about that).
192   \expandafter\ifx\csname#2\string#1\endcsname\relax
193   \else
```

Else: throw away that declaration.

```
194     \global\expandafter\let\csname#2\string#1\endcsname
195     \undefined
```

But this is unfortunately not enough, we have to take a look at the top-level definition of the encoding specific command which for a command `\foo` would look similar to `\T1-cmd \foo \T1\foo` (three tokens).

Of course, instead of `T1` one could see a different encoding name; which one depends the encoding for which `\foo` was declared last.

Now assume we have just removed the declaration for `\foo` in `T1` and the top-level of `\foo` expands to the above. Then we better change that pretty fast otherwise we do get an “undefined csname error” when we try to typeset `\foo` within `T1` instead of getting the default definition for `\foo`. And what is the best way to change that top-level definition? Well, the only “encoding” we know for sure will still be around is the default encoding denoted by `?`.

Thus in case the last token of the top-level expansion is now undefined we change the declaration to look like `\?-cmd \foo \?\foo` which is done by the following (readable?) code:

```
196   \expandafter\expandafter\expandafter
197   \ifx\expandafter\@thirdofthree#1\@undefined
198     \expandafter\gdef\expandafter#1\expandafter
199     {\csname ?-cmd\expandafter\endcsname\expandafter
200      #1\csname?\string#1\endcsname}%
201   \fi
202 \fi
203 }
```

```
204 \@onlypreamble\UndeclareTextCommand
```

*(End definition for \UndeclareTextCommand.)*

### 1.4.2 Hyphenation

`\patterns` We redefine `\patterns` and `\hyphenation` to allow the use of commands declared with  
`\@@patterns` `\DeclareText*` to be used inside them.  
`\hyphenation`  
`\@@hyphenation`

```
205 %\let\@@patterns\patterns
206 %\let\@@hyphenation\hyphenation
207 %\def\patterns{%
208 %   \bgroup
209 %     \let\protect\@empty
210 %     \let\@typeset@protect\@empty
211 %     \let\@changed@x\@changed@x@mouth
212 %   \afterassignment\egroup
213 %   \@@patterns
214 %}
215 %\def\hyphenation{%
216 %   \bgroup
217 %     \let\protect\@empty
218 %     \let\@typeset@protect\@empty
219 %     \let\@changed@x\@changed@x@mouth
220 %   \afterassignment\egroup
221 %   \@@hyphenation
222 %}
```

*(End definition for \patterns and others.)*

### 1.4.3 Miscellania

`\a` The `\a` command is used to access the accent commands even when they have been redefined (for example by the `\tabbing` environment). Its internal name is `\@tabacckludge`.  
The `\string` within the `\csname` guards against something like `'` being active at the point of use.

```
223 \def\@tabacckludge#1{\expandafter\@changed@cmd
224                                     \csname\string#1\endcsname\relax}
225 \let\a=\@tabacckludge
```

*(End definition for \a.)*

### 1.4.4 Default encodings

We define the default encodings for most commands to be either OT1, OML or OMS. These defaults are in the kernel and therefore fonts with these encodings must be available unless these defaults are redefined elsewhere. Recall that the standard kernel loads the encoding files for these encodings, and also that for the T1 encoding.

The naming conventions in the kernel are not what we would use if we were starting from scratch... Those defined by DEK (like `\ae` and `\ss`) or by the T<sub>E</sub>X Users Group Technical Working Group on multi-lingual typesetting (like `\th` and `\ng`) have short names. Those which were added to the kernel in 1993 and early 1994 are named after their Adobe glyph names (like `\guillemotleft` and `\quotedblbase`). Unfortunately, this naming scheme won't work for all glyphs, since some names (like `\space`) are already used, and some (like `\endash`) are very likely to be defined by users. So we're now using the naming scheme of `\text` followed by the Adobe name, (like `\textendash` and `\textsterling`). Except that some glyphs don't have Adobe names, so we're using the names used by fontinst for those (like `\textcompwordmark`). Sigh.

Some accents from OT1:

```
226 \DeclareTextAccentDefault{"}{OT1}
227 \DeclareTextAccentDefault{'}{OT1}
228 \DeclareTextAccentDefault{.}{OT1}
229 \DeclareTextAccentDefault{=}{OT1}
230 \DeclareTextAccentDefault{H}{OT1}
231 \DeclareTextAccentDefault{^}{OT1}
232 \DeclareTextAccentDefault{'}{OT1}
233 \DeclareTextAccentDefault{b}{OT1}
234 \DeclareTextAccentDefault{c}{OT1}
235 \DeclareTextAccentDefault{d}{OT1}
236 \DeclareTextAccentDefault{r}{OT1}
237 \DeclareTextAccentDefault{u}{OT1}
238 \DeclareTextAccentDefault{v}{OT1}
239 \DeclareTextAccentDefault{~}{OT1}
```

Some symbols from OT1:

```
240 %\DeclareTextSymbolDefault{AA}{OT1}
241 \DeclareTextSymbolDefault{AE}{OT1}
242 \DeclareTextSymbolDefault{L}{OT1}
243 \DeclareTextSymbolDefault{OE}{OT1}
244 \DeclareTextSymbolDefault{O}{OT1}
245 %\DeclareTextSymbolDefault{aa}{OT1}
246 \DeclareTextSymbolDefault{ae}{OT1}
247 \DeclareTextSymbolDefault{i}{OT1}
248 \DeclareTextSymbolDefault{j}{OT1}

249 \DeclareTextSymbolDefault{ij}{OT1}
250 \DeclareTextSymbolDefault{IJ}{OT1}

251 \DeclareTextSymbolDefault{l}{OT1}
252 \DeclareTextSymbolDefault{oe}{OT1}
253 \DeclareTextSymbolDefault{o}{OT1}
254 \DeclareTextSymbolDefault{ss}{OT1}
255 \DeclareTextSymbolDefault{textdollar}{OT1}
256 \DeclareTextSymbolDefault{textemdash}{OT1}
257 \DeclareTextSymbolDefault{textendash}{OT1}
258 \DeclareTextSymbolDefault{textexclamdown}{OT1}
259 %\DeclareTextSymbolDefault{texthyphenchar}{OT1}
260 %\DeclareTextSymbolDefault{texthyphen}{OT1}
261 \DeclareTextSymbolDefault{textquestiondown}{OT1}
262 \DeclareTextSymbolDefault{textquotedblleft}{OT1}
263 \DeclareTextSymbolDefault{textquotedblright}{OT1}
264 \DeclareTextSymbolDefault{textquoteleft}{OT1}
265 \DeclareTextSymbolDefault{textquoteright}{OT1}
266 \DeclareTextSymbolDefault{textsterling}{OT1}
```

Some symbols from OMS:

```
267 \DeclareTextSymbolDefault{textasteriskcentered}{OMS}
268 \DeclareTextSymbolDefault{textbackslash}{OMS}
269 \DeclareTextSymbolDefault{textbar}{OMS}
270 \DeclareTextSymbolDefault{textbardbl}{OMS}
271 \DeclareTextSymbolDefault{textbraceleft}{OMS}
272 \DeclareTextSymbolDefault{textbraceright}{OMS}
273 \DeclareTextSymbolDefault{textbullet}{OMS}
```

```

274 \DeclareTextSymbolDefault{\textdaggerdbl}{OMS}
275 \DeclareTextSymbolDefault{\textdagger}{OMS}
276 \DeclareTextSymbolDefault{\textparagraph}{OMS}
277 \DeclareTextSymbolDefault{\textperiodcentered}{OMS}
278 \DeclareTextSymbolDefault{\textsection}{OMS}
279 \DeclareTextAccentDefault{\textcircled}{OMS}

    Some symbols from OML:
280 \DeclareTextSymbolDefault{\textless}{OML}
281 \DeclareTextSymbolDefault{\textgreater}{OML}
282 \DeclareTextAccentDefault{\t}{OML}

    Some defaults we can fake.
    The interface for defining \copyright changed, it used to use \expandafter to add
    braces at the appropriate points.
283 \DeclareTextCommandDefault{\textcopyright}{\textcircled{c}}
284 % \expandafter\def\expandafter
285 % \copyright\expandafter{\expandafter{\copyright}}

286 \DeclareTextCommandDefault{\textasciicircum}{\~{}}
287 \DeclareTextCommandDefault{\textasciitilde}{\~{}}
288 \DeclareTextCommandDefault{\textunderscore}{%
289 \leavevmode \kern.06em\vbox{\hrule\@width.3em}}

    There is no good reason anymore to fake \textcompwordmark.
290 %\DeclareTextCommandDefault{\textcompwordmark}{\leavevmode\kern\z@}
291 \DeclareTextSymbolDefault{\textcompwordmark}{T1}

292 \DeclareTextCommandDefault{\textvisiblespace}{%
293 \mbox{\kern.06em\vrule \@height.3ex}%
294 \vbox{\hrule \@width.3em}%
295 \hbox{\vrule \@height.3ex}}

    Using \fontdimen3 in the next definition is some sort of a kludge (since it is the
    interword stretch) but it makes the ellipsis come out right in mono-spaced fonts too (since
    there it is zero).
296 \DeclareTextCommandDefault{\textellipsis}{%
297 .\kern\fontdimen3\font
298 .\kern\fontdimen3\font
299 .\kern\fontdimen3\font}

300 %\DeclareTextCommandDefault{\textregistered}{\textcircled{\scshape r}}
301 \DeclareTextCommandDefault{\textregistered}{\textcircled{%
302 \check@mathfonts\fontsize\sf@size\z@\math@fontsfalse\selectfont R}}
303 \DeclareTextCommandDefault{\texttrademark}{\textsuperscript{TM}}
304 \DeclareTextCommandDefault{\SS}{SS}

305 \DeclareTextCommandDefault{\textordfeminine}{\textsuperscript{a}}
306 \DeclareTextCommandDefault{\textordmasculine}{\textsuperscript{o}}

```



### 1.4.5 Math material

Some commands can be used in both text and math mode:

```
307 \DeclareRobustCommand{\$}{\ifmmode\mathdollar\else\textdollar\fi}
```

We use `\protected` not `\DeclareRobustCommand` so that `\bigl\{` etc. works inside `\protected@edef`.

```
308 \protected\def{{\ifmmode\lbrace\else\textbraceleft\fi}
```

```
309 \protected\def\}{\ifmmode\rbrace\else\textbraceright\fi}
```

```
310 \DeclareRobustCommand{\P}{\ifmmode\mathparagraph\else\textparagraph\fi}
```

```
311 \DeclareRobustCommand{\S}{\ifmmode\mathsection\else\textsection\fi}
```

```
312 \DeclareRobustCommand{\dag}{\ifmmode{\dagger}\else\textdagger\fi}
```

```
313 \DeclareRobustCommand{\ddag}{\ifmmode{\ddagger}\else\textdaggerdbl\fi}
```

For historical reasons `\copyright` needs `{}` around the definition in maths.

```
314 \DeclareRobustCommand{\_}{%
```

```
315   \ifmmode\nfss@text{\textunderscore}\else\textunderscore\fi}
```

```
316 \DeclareRobustCommand{\copyright}{%
```

```
317   \ifmmode{\nfss@text{\textcopyright}}\else\textcopyright\fi}
```

```
318 \DeclareRobustCommand{\pounds}{%
```

```
319   \ifmmode\mathsterling\else\textsterling\fi}
```

```
320 \DeclareRobustCommand{\dots}{%
```

```
321   \ifmmode\mathellipsis\else\textellipsis\fi}
```

```
322 \let\ldots\dots
```

Default definition of the `commabelow` accent.

```
323 </2ekernel>
```

```
324 <latexrelease>\IncludeInRelease{2015/10/01}{\textcommabelow}{comma accent}%
```

```
325 <*2ekernel | latexrelease>
```

```
326 \DeclareTextCommandDefault\textcommabelow[1]
```

```
327   {\hmode\bgroup\ooalign{\null#1\cr\hidewidth\raise-.31ex
```

```
328     \hbox{\check@mathfonts\fontsize\ssf@size\z@
```

```
329     \math@fontsfalse\selectfont,}\hidewidth}\egroup}
```

```
330 <latexrelease>\EndIncludeInRelease
```

```
331 </2ekernel | latexrelease>
```

```
332 <latexrelease>\IncludeInRelease{0000/00/00}{\textcommabelow}{comma accent}%
```

```
333 <latexrelease>\let\textcommabelow\@undefined
```

```
334 <latexrelease>\expandafter
```

```
335 <latexrelease> \let\csname\string\T1\string\c-G\endcsname\@undefined
```

```
336 <latexrelease>\expandafter
```

```
337 <latexrelease> \let\csname\string\T1\string\c-K\endcsname\@undefined
```

```
338 <latexrelease>\expandafter
```

```
339 <latexrelease> \let\csname\string\T1\string\c-k\endcsname\@undefined
```

```
340 <latexrelease>\expandafter
```

```
341 <latexrelease> \let\csname\string\T1\string\c-L\endcsname\@undefined
```

```
342 <latexrelease>\expandafter
```

```
343 <latexrelease> \let\csname\string\T1\string\c-l\endcsname\@undefined
```

```
344 <latexrelease>\expandafter
```

```
345 <latexrelease> \let\csname\string\T1\string\c-N\endcsname\@undefined
```

```
346 <latexrelease>\expandafter
```

```
347 <latexrelease> \let\csname\string\T1\string\c-n\endcsname\@undefined
```

```
348 <latexrelease>\expandafter
```

```
349 <latexrelease> \let\csname\string\T1\string\c-R\endcsname\@undefined
```

```

350 <latexrelease>\expandafter
351 <latexrelease> \let\cename\string\T1\string\c-r\endcsname\@undefined
352 <latexrelease>\EndIncludeInRelease
    Default definition of the commaabove accent(E.G.).
353 <latexrelease>\IncludeInRelease{2016/02/01}{\textcommaabove}{comma above}%
354 <*2ekernel | latexrelease>
355 \DeclareTextCommandDefault\textcommaabove[1]{%
356   \hmode\bgroup
357   \ooalign{%
358     \hidewidth
359     \raise.7ex\hbox{%
360       \check@mathfonts\fontsize\ssf@size\z@\math@fontsfalse\selectfont'%
361     }%
362     \hidewidth\crrcr
363     \null#1\crrcr
364   }%
365   \egroup
366 }
367 <latexrelease>\EndIncludeInRelease
368 </2ekernel | latexrelease>
369 <latexrelease>\IncludeInRelease{0000/00/00}{\textcommaabove}{comma above}%
370 <latexrelease>\let\textcommaabove\@undefined
371 <latexrelease>\expandafter
372 <latexrelease> \let\cename\string\OT1\string\c-g\endcsname\@undefined
373 <latexrelease>\expandafter
374 <latexrelease> \let\cename\string\T1\string\c-g\endcsname\@undefined
375 <latexrelease>\EndIncludeInRelease

```

## 1.5 Definitions for the OT1 encoding

The definitions for the ‘T<sub>E</sub>X text’ (OT1) encoding.

Declare the encoding.

```

376 <*OT1>
377 \DeclareFontEncoding{OT1}{-}{-}

```

Declare the accents.

```

378 \DeclareTextAccent{"}{OT1}{127}
379 \DeclareTextAccent{'}{OT1}{19}
380 \DeclareTextAccent{.}{OT1}{95}
381 \DeclareTextAccent{=}{OT1}{22}
382 \DeclareTextAccent{^}{OT1}{94}
383 \DeclareTextAccent{'}{OT1}{18}
384 \DeclareTextAccent{\~}{OT1}{126}
385 \DeclareTextAccent{\H}{OT1}{125}
386 \DeclareTextAccent{\u}{OT1}{21}
387 \DeclareTextAccent{\v}{OT1}{20}
388 \DeclareTextAccent{\r}{OT1}{23}

```

Some accents have to be built by hand: Note that `\ooalign` and `\o@lign` must be inside a group. In these definitions we no longer use the helper function `\sh@ft` from `plain.tex` since that now has two incompatible definitions.

```

389 \DeclareTextCommand{\b}{OT1}[1]
390   {\hmode\bgroup\o@lign{\relax#1\crrcr\hidewidth\ltx@sh@ft{-3ex}}%

```

```

391 \vbox to.2ex{\hbox{\char22}\vss}\hidewidth}\egroup}
392 \DeclareTextCommand{\c}{OT1}[1]
393 {\leavevmode\setbox\z@\hbox{#1}\ifdim\ht\z@=1ex\accent24 #1%
394 \else\oalign{\unhbox\z@\crrc\hidewidth\char24\hidewidth}}\fi}
395 \DeclareTextCommand{\d}{OT1}[1]
396 {\hmode\bgroup
397 \oalign{\relax#1\crrc\hidewidth\ltx@sh@ft{-1ex}.\hidewidth}\egroup}

```

Declare the text symbols.

```

398 \DeclareTextSymbol{\AE}{OT1}{29}
399 \DeclareTextSymbol{\OE}{OT1}{30}
400 \DeclareTextSymbol{\O}{OT1}{31}
401 \DeclareTextSymbol{\ae}{OT1}{26}
402 \DeclareTextSymbol{\i}{OT1}{16}
403 \DeclareTextSymbol{\j}{OT1}{17}
404 \DeclareTextSymbol{\oe}{OT1}{27}
405 \DeclareTextSymbol{\o}{OT1}{28}
406 \DeclareTextSymbol{\ss}{OT1}{25}
407 \DeclareTextSymbol{\textendash}{OT1}{124}
408 \DeclareTextSymbol{\textendash}{OT1}{123}

```

The `\nobreak\hskip\z@` is there to prevent a break after the hyphen but allow later breaks in the remainder of the word.

```

409 \DeclareTextCommand{\textnonbreakinghyphen}{OT1}{\mbox{-}\nobreak\hskip\z@}
410 \DeclareTextCommand{\textfiguredash}{OT1}{\textendash}
411 \DeclareTextCommand{\texthorizontalbar}{OT1}{\textendash}

```

Using the ligatures helps with OT1 fonts that have `\textexclamdown` and `\textquestiondown` in unusual positions.

```

412 %\DeclareTextSymbol{\textexclamdown}{OT1}{60}
413 %\DeclareTextSymbol{\textquestiondown}{OT1}{62}
414 \DeclareTextCommand{\textexclamdown}{OT1}{\!'}
415 \DeclareTextCommand{\textquestiondown}{OT1}{\?' }
416 %\DeclareTextSymbol{\texthyphenchar}{OT1}{'\-}
417 %\DeclareTextSymbol{\texthyphen}{OT1}{'\-}
418 \DeclareTextSymbol{\textquotedblleft}{OT1}{92}
419 \DeclareTextSymbol{\textquotedblright}{OT1}{'\"}
420 \DeclareTextSymbol{\textquoteleft}{OT1}{'\'}
421 \DeclareTextSymbol{\textquoteright}{OT1}{'\'}

```

Some symbols which are faked from others:

```

422 % \DeclareTextCommand{\aa}{OT1}
423 % {\accent23a}
424 \DeclareTextCommand{\L}{OT1}
425 {\leavevmode\setbox\z@\hbox{L}\hb@xt@\wd\z@{\hss\@xxxii L}}
426 \DeclareTextCommand{\l}{OT1}
427 {\hmode\bgroup\@xxxii l\egroup}
428 % \DeclareTextCommand{\AA}{OT1}
429 % {\leavevmode\setbox\z@\hbox{h}\dimen@ht\z@\advance\dimen@-1ex%
430 % \rlap{\raise.67\dimen@\hbox{\char23}}A}

```

In the OT1 encoding Å has a hand-crafted definition, so we have here the first recorded explicit use of `\DeclareTextCompositeCommand`.

```

431 \DeclareTextCompositeCommand{\r}{OT1}{A}
432 {\leavevmode\setbox\z@\hbox{!}\dimen@ht\z@\advance\dimen@-1ex%
433 \rlap{\raise.67\dimen@\hbox{\char23}}A}

```

The dutch language uses the letter ‘ij’. It is available in T1 encoded fonts, but not in the OT1 encoded fonts. Therefore we fake it for the OT1 encoding.

```
434 \DeclareTextCommand{\ij}{OT1}{%
435   \nobreak\hskip\z@skip i\kern-0.02em\nobreak\hskip\z@skip j}
436 \DeclareTextCommand{\IJ}{OT1}{%
437   \nobreak\hskip\z@skip I\kern-0.02em\nobreak\hskip\z@skip J}
```

In the OT1 encoding, £ and \$ share a slot.

```
438 \DeclareTextCommand{\textdollar}{OT1}{\hmode@bgroup
439   \ifdim \fontdimen\@ne\font >\z@
440     \slshape
441   \else
442     \upshape
443   \fi
444   \char‘\$ \egroup}

445 \DeclareTextCommand{\textsterling}{OT1}{\hmode@bgroup
446   \ifdim \fontdimen\@ne\font >\z@
447     \itshape
448   \else
449     \fontshape{ui}\selectfont
450   \fi
451   \char‘$ \egroup}
```

Here we are adding some more composite commands to the OT1 encoding. This makes the use of certain accents with i compatible with their use with the T1 encoding; this enables them to become true L<sup>A</sup>T<sub>E</sub>X internal representations. However, it will make these accents work a little less fast since a check will always be made for the existence of a composite.

```
452 \DeclareTextComposite{\.}{OT1}{i}{‘\i}
453 \DeclareTextComposite{\.}{OT1}{i}{‘\i}
454 \DeclareTextCompositeCommand{\'}{OT1}{i}{\@tabacckludge‘\i}
455 \DeclareTextCompositeCommand{\'}{OT1}{i}{\@tabacckludge‘\i}
456 \DeclareTextCompositeCommand{\~}{OT1}{i}{\^{\i}}
457 \DeclareTextCompositeCommand{\~}{OT1}{i}{\^{\i}}
```

T1 encoding is given more extensive set of overloads for \c But here we just adjust \c{g}.

```
458 \ifx\textcommaabove\undefined\else
459 \DeclareTextCompositeCommand{\c}{OT1}{g}{\textcommaabove{g}}
460 \fi
461 </OT1>
```

## 1.6 Definitions for the T1 encoding

The definitions for the ‘Extended T<sub>E</sub>X text’ (T1) encoding.

Declare the encoding.

```
462 <*T1>
463 \DeclareFontEncoding{T1}{\font}
```

Declare the accents.

```
464 \DeclareTextAccent{\'}{T1}{0}
465 \DeclareTextAccent{\'}{T1}{1}
466 \DeclareTextAccent{\~}{T1}{2}
```

```

467 \DeclareTextAccent{\~}{T1}{3}
468 \DeclareTextAccent{\"}{T1}{4}
469 \DeclareTextAccent{\H}{T1}{5}
470 \DeclareTextAccent{\r}{T1}{6}
471 \DeclareTextAccent{\v}{T1}{7}
472 \DeclareTextAccent{\u}{T1}{8}
473 \DeclareTextAccent{\=}{T1}{9}
474 \DeclareTextAccent{\.}{T1}{10}

```

Some accents have to be built by hand. Note that `\ooalign` and `\oalign` must be inside a group. In these definitions we no longer use the helper function `\sh@ft` from `plain.tex` since that now has two incompatible definitions.

```

475 \DeclareTextCommand{\b}{T1}[1]
476   {\hmode\bgroup\oalign{\relax#1\crcr\hidewidth\ltx@sh@ft{-3ex}%
477     \vbox to.2ex{\hbox{\char9}\vss}\hidewidth}\egroup}
478 \DeclareTextCommand{\c}{T1}[1]
479   {\leavevmode\setbox\z@\hbox{#1}\ifdim\ht\z@=1ex\accent11 #1%
480     \else{\ooalign{\unhbox\z@\crcr
481       \hidewidth\char11\hidewidth}}\fi}
482 \DeclareTextCommand{\d}{T1}[1]
483   {\hmode\bgroup
484     \oalign{\relax#1\crcr\hidewidth\ltx@sh@ft{-1ex}.\hidewidth}\egroup}
485 \DeclareTextCommand{\k}{T1}[1]
486   {\hmode\bgroup\ooalign{\null#1\crcr\hidewidth\char12}\egroup}
487 \DeclareTextCommand{\textogonekcentered}{T1}[1]
488   {\hmode\bgroup\ooalign{%
489     \null#1\crcr\hidewidth\char12\hidewidth}\egroup}

```

Some symbols are constructed.

Slot 24 contains a small circle intended for construction of these two glyphs.

```

490 \DeclareTextCommand{\textperthousand}{T1}
491   {\%\char 24 } % space or 'relax as delimiter?
492 \DeclareTextCommand{\textpertenthousand}{T1}
493   {\%\char 24\char 24 } % space or 'relax as delimiter?

```

For Maltese, `\Hwithstroke` and `\hwithstroke` are needed.

```

494 \DeclareTextCommand{\Hwithstroke}{T1}
495   {%
496     \hmode\bgroup
497     \vphantom{H}%
498     \sbox\z@{H}%
499     \ooalign{%
500       H\cr
501       \hidewidth
502       \vrule
503         height \dimexpr 0.7\ht\z@+0.1ex\relax
504         depth -0.7\ht\z@
505         width 0.8\wd\z@
506       \hidewidth\cr
507     }%
508     \egroup
509   }
510 \DeclareTextCommand{\hwithstroke}{T1}
511   {%

```

```

512 \hmode@bgroup
513 \vphantom{h}%
514 \sbox\z@{h}%
515 \ooalign{%
516   h\cr
517   \kern0.075\wd\z@
518   \vrule
519     height \dimexpr 0.7\ht\z@+0.1ex\relax
520     depth  -0.7\ht\z@
521     width  0.4\wd\z@
522   \hidewidth\cr
523 }%
524 \egroup
525 }

```

Declare the text symbols.

```

526 %\DeclareTextSymbol{\AA}{T1}{197}
527 \DeclareTextSymbol{\AE}{T1}{198}
528 \DeclareTextSymbol{\DH}{T1}{208}
529 \DeclareTextSymbol{\DJ}{T1}{208}
530 \DeclareTextSymbol{\L}{T1}{138}
531 \DeclareTextSymbol{\NG}{T1}{141}
532 \DeclareTextSymbol{\OE}{T1}{215}
533 \DeclareTextSymbol{\O}{T1}{216}
534 \DeclareTextSymbol{\SS}{T1}{223}
535 \DeclareTextSymbol{\TH}{T1}{222}
536 %\DeclareTextSymbol{\aa}{T1}{229}
537 \DeclareTextSymbol{\ae}{T1}{230}
538 \DeclareTextSymbol{\dh}{T1}{240}
539 \DeclareTextSymbol{\dj}{T1}{158}

540 \DeclareTextSymbol{\guillemetleft}{T1}{19}
541 \DeclareTextSymbol{\guillemetright}{T1}{20}
542 % old Adobe names
543 \DeclareTextSymbol{\guillemotleft}{T1}{19}
544 \DeclareTextSymbol{\guillemotright}{T1}{20}

545 \DeclareTextSymbol{\guilsinglleft}{T1}{14}
546 \DeclareTextSymbol{\guilsinglright}{T1}{15}
547 \DeclareTextSymbol{\i}{T1}{25}
548 \DeclareTextSymbol{\j}{T1}{26}
549 \DeclareTextSymbol{\ij}{T1}{188}
550 \DeclareTextSymbol{\IJ}{T1}{156}
551 \DeclareTextSymbol{\l}{T1}{170}
552 \DeclareTextSymbol{\ng}{T1}{173}
553 \DeclareTextSymbol{\oe}{T1}{247}
554 \DeclareTextSymbol{\o}{T1}{248}
555 \DeclareTextSymbol{\quotedblbase}{T1}{18}
556 \DeclareTextSymbol{\quotesinglbase}{T1}{13}
557 \DeclareTextSymbol{\ss}{T1}{255}
558 \DeclareTextSymbol{\textasciicircum}{T1}{'\^}
559 \DeclareTextSymbol{\textasciitilde}{T1}{'\~}
560 \DeclareTextSymbol{\textbackslash}{T1}{'\}
561 \DeclareTextSymbol{\textbar}{T1}{'|}
562 \DeclareTextSymbol{\textbraceleft}{T1}{'\{ }

```

```

563 \DeclareTextSymbol{\textbraceright}{T1}{\}
564 \DeclareTextSymbol{\textcompwordmark}{T1}{23}
565 \DeclareTextSymbol{\textdollar}{T1}{\$}
566 \DeclareTextSymbol{\textendash}{T1}{22}
567 \DeclareTextSymbol{\textendash}{T1}{21}

```

The `\nobreak\hskip\z@` is there to prevent a break after the hyphen but allow later breaks in the remainder of the word.

```

568 \DeclareTextCommand{\textnonbreakinghyphen}{T1}{\mbox{-}\nobreak\hskip\z@}
569 \DeclareTextCommand{\textfiguredash}{T1}{\textendash}
570 \DeclareTextCommand{\texthorizontalbar}{T1}{\textendash}

571 \DeclareTextSymbol{\textexclamdown}{T1}{189}
572 \DeclareTextSymbol{\textgreater}{T1}{>}
573 %\DeclareTextSymbol{\textthyphenchar}{T1}{127}
574 %\DeclareTextSymbol{\textthyphen}{T1}{\~}
575 \DeclareTextSymbol{\textless}{T1}{<}
576 \DeclareTextSymbol{\textquestiondown}{T1}{190}
577 \DeclareTextSymbol{\textquotedblleft}{T1}{16}
578 \DeclareTextSymbol{\textquotedblright}{T1}{17}
579 \DeclareTextSymbol{\textquotedbl}{T1}{`"}
580 \DeclareTextSymbol{\textquoteleft}{T1}{`'}
581 \DeclareTextSymbol{\textquoteright}{T1}{`'}
582 \DeclareTextSymbol{\textsection}{T1}{159}
583 \DeclareTextSymbol{\textsterling}{T1}{191}
584 \DeclareTextSymbol{\textunderscore}{T1}{95}
585 \DeclareTextSymbol{\textvisiblespace}{T1}{32}
586 \DeclareTextSymbol{\th}{T1}{254}

```

Declare the composites.

```

587 \DeclareTextComposite{\.}{T1}{i}{\i}
588 \DeclareTextComposite{\.}{T1}{i}{\i}

```

"80 = 128

```

589 \DeclareTextComposite{\u}{T1}{A}{128}
590 \DeclareTextComposite{\k}{T1}{A}{129}
591 \DeclareTextComposite{\'}{T1}{C}{130}
592 \DeclareTextComposite{\v}{T1}{C}{131}
593 \DeclareTextComposite{\v}{T1}{D}{132}
594 \DeclareTextComposite{\v}{T1}{E}{133}
595 \DeclareTextComposite{\k}{T1}{E}{134}
596 \DeclareTextComposite{\u}{T1}{G}{135}

```

"88 = 136

```

597 \DeclareTextComposite{\'}{T1}{L}{136}
598 \DeclareTextComposite{\v}{T1}{L}{137}
599 \DeclareTextComposite{\'}{T1}{N}{139}
600 \DeclareTextComposite{\v}{T1}{N}{140}
601 \DeclareTextComposite{\H}{T1}{O}{142}
602 \DeclareTextComposite{\'}{T1}{R}{143}

```

"90 = 144

```

603 \DeclareTextComposite{\v}{T1}{R}{144}
604 \DeclareTextComposite{\'}{T1}{S}{145}
605 \DeclareTextComposite{\v}{T1}{S}{146}
606 \DeclareTextComposite{\c}{T1}{S}{147}

```

```

607 \DeclareTextComposite{\v}{T1}{T}{148}
608 \DeclareTextComposite{\c}{T1}{T}{149}
609 \DeclareTextComposite{\H}{T1}{U}{150}
610 \DeclareTextComposite{\r}{T1}{U}{151}
"98 = 152
611 \DeclareTextComposite{\"}{T1}{Y}{152}
612 \DeclareTextComposite{\'}{T1}{Z}{153}
613 \DeclareTextComposite{\v}{T1}{Z}{154}
614 \DeclareTextComposite{\.}{T1}{Z}{155}
615 \DeclareTextComposite{\.}{T1}{I}{157}
"A0 = 160
616 \DeclareTextComposite{\u}{T1}{a}{160}
617 \DeclareTextComposite{\k}{T1}{a}{161}
618 \DeclareTextComposite{\'}{T1}{c}{162}
619 \DeclareTextComposite{\v}{T1}{c}{163}
620 \DeclareTextComposite{\v}{T1}{d}{164}
621 \DeclareTextComposite{\v}{T1}{e}{165}
622 \DeclareTextComposite{\k}{T1}{e}{166}
623 \DeclareTextComposite{\u}{T1}{g}{167}
"A8 = 168
624 \DeclareTextComposite{\'}{T1}{l}{168}
625 \DeclareTextComposite{\v}{T1}{l}{169}
626 \DeclareTextComposite{\'}{T1}{n}{171}
627 \DeclareTextComposite{\v}{T1}{n}{172}
628 \DeclareTextComposite{\H}{T1}{o}{174}
629 \DeclareTextComposite{\'}{T1}{r}{175}
"B0 = 176
630 \DeclareTextComposite{\v}{T1}{r}{176}
631 \DeclareTextComposite{\'}{T1}{s}{177}
632 \DeclareTextComposite{\v}{T1}{s}{178}
633 \DeclareTextComposite{\c}{T1}{s}{179}
634 \DeclareTextComposite{\v}{T1}{t}{180}
635 \DeclareTextComposite{\c}{T1}{t}{181}
636 \DeclareTextComposite{\H}{T1}{u}{182}
637 \DeclareTextComposite{\r}{T1}{u}{183}
"B8 = 184
638 \DeclareTextComposite{\"}{T1}{y}{184}
639 \DeclareTextComposite{\'}{T1}{z}{185}
640 \DeclareTextComposite{\v}{T1}{z}{186}
641 \DeclareTextComposite{\.}{T1}{z}{187}
"C0 = 192
642 \DeclareTextComposite{\'}{T1}{A}{192}
643 \DeclareTextComposite{\'}{T1}{A}{193}
644 \DeclareTextComposite{\^}{T1}{A}{194}
645 \DeclareTextComposite{\~}{T1}{A}{195}
646 \DeclareTextComposite{\"}{T1}{A}{196}
647 \DeclareTextComposite{\r}{T1}{A}{197}
648 \DeclareTextComposite{\c}{T1}{C}{199}

```



"C8 = 200

```

649 \DeclareTextComposite{\'}{T1}{E}{200}
650 \DeclareTextComposite{\'}{T1}{E}{201}
651 \DeclareTextComposite{\^}{T1}{E}{202}
652 \DeclareTextComposite{\"}{T1}{E}{203}
653 \DeclareTextComposite{\'}{T1}{I}{204}
654 \DeclareTextComposite{\'}{T1}{I}{205}
655 \DeclareTextComposite{\^}{T1}{I}{206}
656 \DeclareTextComposite{\"}{T1}{I}{207}

```

"D0 = 208

```

657 \DeclareTextComposite{\~}{T1}{N}{209}
658 \DeclareTextComposite{\'}{T1}{O}{210}
659 \DeclareTextComposite{\'}{T1}{O}{211}
660 \DeclareTextComposite{\^}{T1}{O}{212}
661 \DeclareTextComposite{\~}{T1}{O}{213}
662 \DeclareTextComposite{\"}{T1}{O}{214}

```

"D8 = 216

```

663 \DeclareTextComposite{\'}{T1}{U}{217}
664 \DeclareTextComposite{\'}{T1}{U}{218}
665 \DeclareTextComposite{\^}{T1}{U}{219}
666 \DeclareTextComposite{\"}{T1}{U}{220}
667 \DeclareTextComposite{\'}{T1}{Y}{221}

```

"E0 = 224

```

668 \DeclareTextComposite{\'}{T1}{a}{224}
669 \DeclareTextComposite{\'}{T1}{a}{225}
670 \DeclareTextComposite{\^}{T1}{a}{226}
671 \DeclareTextComposite{\~}{T1}{a}{227}
672 \DeclareTextComposite{\"}{T1}{a}{228}
673 \DeclareTextComposite{\r}{T1}{a}{229}
674 \DeclareTextComposite{\c}{T1}{c}{231}

```

"E8 = 232

```

675 \DeclareTextComposite{\'}{T1}{e}{232}
676 \DeclareTextComposite{\'}{T1}{e}{233}
677 \DeclareTextComposite{\^}{T1}{e}{234}
678 \DeclareTextComposite{\"}{T1}{e}{235}
679 \DeclareTextComposite{\'}{T1}{i}{236}
680 \DeclareTextComposite{\'}{T1}{i}{236}
681 \DeclareTextComposite{\'}{T1}{i}{237}
682 \DeclareTextComposite{\'}{T1}{i}{237}
683 \DeclareTextComposite{\^}{T1}{i}{238}
684 \DeclareTextComposite{\^}{T1}{i}{238}
685 \DeclareTextComposite{\"}{T1}{i}{239}
686 \DeclareTextComposite{\"}{T1}{i}{239}

```

"F0 = 240

```

687 \DeclareTextComposite{\~}{T1}{n}{241}
688 \DeclareTextComposite{\'}{T1}{o}{242}
689 \DeclareTextComposite{\'}{T1}{o}{243}
690 \DeclareTextComposite{\^}{T1}{o}{244}
691 \DeclareTextComposite{\~}{T1}{o}{245}
692 \DeclareTextComposite{\"}{T1}{o}{246}

```

"F8 = 248

```

693 \DeclareTextComposite{\'}{T1}{u}{249}
694 \DeclareTextComposite{\'}{T1}{u}{250}
695 \DeclareTextComposite{\^}{T1}{u}{251}
696 \DeclareTextComposite{\"}{T1}{u}{252}
697 \DeclareTextComposite{\'}{T1}{y}{253}

698 \DeclareTextCompositeCommand{\k}{T1}{o}{\textogonekcentered{o}}
699 \DeclareTextCompositeCommand{\k}{T1}{O}{\textogonekcentered{O}}

700 \ifx\textcommaabove\undefined\else
701 \DeclareTextCompositeCommand{\c}{T1}{g}{\textcommaabove{g}}
702 \fi
703 \ifx\textcommabelow\undefined\else
704 \DeclareTextCompositeCommand{\c}{T1}{G}{\textcommabelow{G}}
705 \DeclareTextCompositeCommand{\c}{T1}{K}{\textcommabelow{K}}
706 \DeclareTextCompositeCommand{\c}{T1}{k}{\textcommabelow{k}}
707 \DeclareTextCompositeCommand{\c}{T1}{L}{\textcommabelow{L}}
708 \DeclareTextCompositeCommand{\c}{T1}{l}{\textcommabelow{l}}
709 \DeclareTextCompositeCommand{\c}{T1}{N}{\textcommabelow{N}}
710 \DeclareTextCompositeCommand{\c}{T1}{n}{\textcommabelow{n}}
711 \DeclareTextCompositeCommand{\c}{T1}{R}{\textcommabelow{R}}
712 \DeclareTextCompositeCommand{\c}{T1}{r}{\textcommabelow{r}}
713 \fi
714 \end{T1}

```

## 1.7 Definitions for the OMS encoding

The definitions for the ‘TeX math symbol’ (OMS) encoding. Even though this is meant to be a math font, it includes some of the standard L<sup>A</sup>T<sub>E</sub>X text symbols.

Declare the encoding.

```

715 \*OMS
716 \DeclareFontEncoding{OMS}{}{}

```

Declare the symbols. Note that slot 13 has in places been named \Orb: please root out and destroy this impolity wherever you find it!

```

717 \DeclareTextSymbol{\textasteriskcentered}{OMS}{3} % "03
718 \DeclareTextSymbol{\textbackslash}{OMS}{110} % "6E
719 \DeclareTextSymbol{\textbar}{OMS}{106} % "6A
720 \DeclareTextSymbol{\textbardbl}{OMS}{107} % "6B
721 \DeclareTextSymbol{\textbraceleft}{OMS}{102} % "66
722 \DeclareTextSymbol{\textbraceright}{OMS}{103} % "67
723 \DeclareTextSymbol{\textbullet}{OMS}{15} % "0F
724 \DeclareTextSymbol{\textdaggerdbl}{OMS}{122} % "7A
725 \DeclareTextSymbol{\textdagger}{OMS}{121} % "79
726 \DeclareTextSymbol{\textparagraph}{OMS}{123} % "7B
727 \DeclareTextSymbol{\textperiodcentered}{OMS}{1} % "01
728 \DeclareTextSymbol{\textsection}{OMS}{120} % "78
729 \DeclareTextSymbol{\textbigcircle}{OMS}{13} % "0D
730 \DeclareTextCommand{\textcircled}{OMS}[1]{\hmode@bgroup
731 \oalign{%
732 \hfil \raise .07ex\hbox {\upshape#1}\hfil \crcr
733 \char 13 % "0D

```

```

734 }%
735 \egroup}
736 </OMS>

```

## 1.8 Definitions for the OML encoding

The definitions for the ‘ $\mathrm{T}_\mathrm{E}X$  math italic’ (OML) encoding. Even though this is meant to be a math font, it includes some of the standard  $\mathrm{L}^{\mathrm{A}}\mathrm{T}_\mathrm{E}X$  text symbols.

Declare the encoding.

```

737 <*OML>
738 \DeclareFontEncoding{OML}{-}{-}

```

Declare the symbols.

```

739 \DeclareTextSymbol{\textless}{OML}{'\<}
740 \DeclareTextSymbol{\textgreater}{OML}{'\>}
741 \DeclareTextAccent{\t}{OML}{127} % "7F
742 </OML>

```

## 1.9 Definitions for the OT4 encoding

These definitions are for the Polish extension to the ‘ $\mathrm{T}_\mathrm{E}X$  text’ (OT1) encoding. This encoding was created by B. Jackowski and M. Ryćko for use with the Polish version of Computer Modern and Computer Concrete. In positions 0–127 it is identical to OT1 but it contains some additional characters in the upper half. The  $\mathrm{L}^{\mathrm{A}}\mathrm{T}_\mathrm{E}X$  support was developed by Mariusz Olko.

The PL fonts that use it are available as follows:

Metafont sources <ftp://ftp.gust.org.pl/TeX/language/polish/pl-mf.zip>;

Font files <ftp://ftp.gust.org.pl/TeX/language/polish/pl-tfm.zip>.

Declare the encoding.

```

743 <*OT4>
744 \DeclareFontEncoding{OT4}{-}{-}
745 \DeclareFontSubstitution{OT4}{cmr}{m}{n}

```

Declare the accents.

```

746 \DeclareTextAccent{"}{OT4}{127}
747 \DeclareTextAccent{'}{OT4}{19}
748 \DeclareTextAccent{.}{OT4}{95}
749 \DeclareTextAccent{=}{OT4}{22}
750 \DeclareTextAccent{~}{OT4}{94}
751 \DeclareTextAccent{'}{OT4}{18}
752 \DeclareTextAccent{~}{OT4}{126}
753 \DeclareTextAccent{H}{OT4}{125}
754 \DeclareTextAccent{u}{OT4}{21}
755 \DeclareTextAccent{v}{OT4}{20}
756 \DeclareTextAccent{r}{OT4}{23}

```

The ogonek accent is available only under a e A & E. But we have to provide some definition for `\k`. Some other accents have to be built by hand as in OT1:

```

757 \DeclareTextCommand{\k}{OT4}[1]{%
758   \TextSymbolUnavailable{\k{#1}}#1}

```

In these definitions we no longer use the helper function `\sh@ft` from `plain.tex` since that now has two incompatible definitions.

```

759 \DeclareTextCommand{\b}{OT4}[1]
760   {\hmode\bgroup\o@lign{\relax#1\cr\hidewidth\ltx@sh@ft{-3ex}%
761     \vbox to.2ex{\hbox{\char22}\vss}\hidewidth}\egroup}
762 \DeclareTextCommand{\c}{OT4}[1]
763   {\leavevmode\setbox\z@\hbox{#1}\ifdim\ht\z@=1ex\accent24 #1%
764     \else\oalign{\unhbox\z@\cr\hidewidth\char24\hidewidth}}\fi}
765 \DeclareTextCommand{\d}{OT4}[1]
766   {\hmode\bgroup
767     \o@lign{\relax#1\cr\hidewidth\ltx@sh@ft{-1ex}.\hidewidth}\egroup}

```

Declare the text symbols.

```

768 \DeclareTextSymbol{\AE}{OT4}{29}
769 \DeclareTextSymbol{\OE}{OT4}{30}
770 \DeclareTextSymbol{\O}{OT4}{31}
771 \DeclareTextSymbol{\L}{OT4}{138}
772 \DeclareTextSymbol{\ae}{OT4}{26}

773 \DeclareTextSymbol{\guillemetleft}{OT4}{174}
774 \DeclareTextSymbol{\guillemetright}{OT4}{175}
775 % old Adobe names
776 \DeclareTextSymbol{\guillemotleft}{OT4}{174}
777 \DeclareTextSymbol{\guillemotright}{OT4}{175}

778 \DeclareTextSymbol{\i}{OT4}{16}
779 \DeclareTextSymbol{\j}{OT4}{17}
780 \DeclareTextSymbol{\l}{OT4}{170}
781 \DeclareTextSymbol{\o}{OT4}{28}
782 \DeclareTextSymbol{\oe}{OT4}{27}
783 \DeclareTextSymbol{\quotedblbase}{OT4}{255}
784 \DeclareTextSymbol{\ss}{OT4}{25}
785 \DeclareTextSymbol{\textendash}{OT4}{124}
786 \DeclareTextSymbol{\textendash}{OT4}{123}
787 \DeclareTextSymbol{\textexclamdown}{OT4}{60}
788 %\DeclareTextSymbol{\textthyphenchar}{OT4}{'\-}
789 %\DeclareTextSymbol{\textthyphen}{OT4}{'\-}
790 \DeclareTextSymbol{\textquestiondown}{OT4}{62}
791 \DeclareTextSymbol{\textquotedblleft}{OT4}{92}
792 \DeclareTextSymbol{\textquotedblright}{OT4}{'\'}
793 \DeclareTextSymbol{\textquoteleft}{OT4}{'\'}
794 \DeclareTextSymbol{\textquoteright}{OT4}{'\'}

```

Definition for Å as in OT1:

```

795 \DeclareTextCompositeCommand{\r}{OT4}{A}
796   {\leavevmode\setbox\z@\hbox{!}\dimen@ht\z@\advance\dimen@-1ex%
797     \rlap{\raise.67\dimen@\hbox{\char23}}A}

```

In the OT4 encoding, £ and \$ share a slot.

```

798 \DeclareTextCommand{\textdollar}{OT4}{\hmode\bgroup
799   \ifdim \fontdimen\@ne\font >\z@
800     \slshape
801   \else
802     \upshape
803   \fi
804   \char'\$\egroup}

```

```

805 \DeclareTextCommand{\textsterling}{OT4}{\hmode@bgroup
806   \ifdim \fontdimen\@ne\font >\z@
807     \itshape
808   \else
809     \fontshape{ui}\selectfont
810   \fi
811   \char'\$ \egroup}

```

Declare the composites.

```

812 \DeclareTextComposite{\k}{OT4}{A}{129}
813 \DeclareTextComposite{\'}{OT4}{C}{130}
814 \DeclareTextComposite{\k}{OT4}{E}{134}
815 \DeclareTextComposite{\'}{OT4}{N}{139}
816 \DeclareTextComposite{\'}{OT4}{S}{145}
817 \DeclareTextComposite{\'}{OT4}{Z}{153}
818 \DeclareTextComposite{\.}{OT4}{Z}{155}
819 \DeclareTextComposite{\k}{OT4}{a}{161}
820 \DeclareTextComposite{\'}{OT4}{c}{162}
821 \DeclareTextComposite{\k}{OT4}{e}{166}
822 \DeclareTextComposite{\'}{OT4}{n}{171}
823 \DeclareTextComposite{\'}{OT4}{s}{177}
824 \DeclareTextComposite{\'}{OT4}{z}{185}
825 \DeclareTextComposite{\.}{OT4}{z}{187}
826 \DeclareTextComposite{\'}{OT4}{o}{211}
827 \DeclareTextComposite{\'}{OT4}{o}{243}
828 \OT4

```

## 1.10 Definitions for the TS1 encoding

```

829 ⟨*TS1⟩
830 \DeclareFontEncoding{TS1}{}{}
831 \DeclareFontSubstitution{TS1}{cmr}{m}{n}

```

Some accents have to be built by hand. Note that `\ooalign` and `\o@lign` must be inside a group.

```

832 \DeclareTextCommand{\capitalcedilla}{TS1}[1]
833   {\hmode@bgroup
834     \ooalign{\null#1\cr cr\hidewidth\char11\hidewidth}\egroup}
835 \DeclareTextCommand{\capitalogonek}{TS1}[1]
836   {\hmode@bgroup
837     \ooalign{\null#1\cr cr\hidewidth\char12\hidewidth}\egroup}

```

Accents for capital letters.

These commands can be used by the end user either directly or through definitions of the type

```
\DeclareTextCompositeCommand{\'}{T1}{X}{\capitalacute X}
```

None of the latter definitions are provided by default, since they are probably rarely used.

"00 = 0

```

838 \DeclareTextAccent{\capitalgrave}{TS1}{0}
839 \DeclareTextAccent{\capitalacute}{TS1}{1}
840 \DeclareTextAccent{\capitalcircumflex}{TS1}{2}
841 \DeclareTextAccent{\capitaltilde}{TS1}{3}
842 \DeclareTextAccent{\capitaldieresis}{TS1}{4}
843 \DeclareTextAccent{\capitalhungarumlaut}{TS1}{5}

```

```

844 \DeclareTextAccent{\capitalring}{TS1}{6}
845 \DeclareTextAccent{\capitalcaron}{TS1}{7}
"08 = 8
846 \DeclareTextAccent{\capitalbreve}{TS1}{8}
847 \DeclareTextAccent{\capitalmacron}{TS1}{9}
848 \DeclareTextAccent{\capitaldotaccent}{TS1}{10}

```

Tie accents.

The tie accent was borrowed from the `cmmi` font. The `tc` fonts now provide four tie accents, the first two are done in the classical way with asymmetric glyphs hanging out of their boxes; the new ties are centered in their boxes like all other accents. They need a name: please tell us if you know what to call them.

" =

```

849 \DeclareTextAccent{\t}{TS1}{26}
850 \DeclareTextAccent{\capitaltie}{TS1}{27}
851 \DeclareTextAccent{\newtie}{TS1}{28}
852 \DeclareTextAccent{\capitalnewtie}{TS1}{29}

```

Compound word marks.

The text companion fonts contain two compound word marks of different heights, one has `cap_height`, the other `asc_height`.

```

853 \DeclareTextSymbol{\textcapitalcompwordmark}{TS1}{23}
854 \DeclareTextSymbol{\textascendercompwordmark}{TS1}{31}

```

The text companion symbols.

```

855 \DeclareTextSymbol{\textquotestraightbase}{TS1}{13}

```

"10 = 16

```

856 \DeclareTextSymbol{\textquotestraightdblbase}{TS1}{18}
857 \DeclareTextSymbol{\texttwelveudash}{TS1}{21}
858 \DeclareTextSymbol{\textthreequartersemdash}{TS1}{22}

```

"18 = 24

```

859 \DeclareTextSymbol{\textleftarrow}{TS1}{24}
860 \DeclareTextSymbol{\textrightarrow}{TS1}{25}

```

"20 = 32

```

861 \DeclareTextSymbol{\textblank}{TS1}{32}
862 \DeclareTextSymbol{\textdollar}{TS1}{36}
863 \DeclareTextSymbol{\textquotesingle}{TS1}{39}

```

"28 = 40

The symbol `\textasteriskcentered` “\*” is supposed to be always available in `TS1` and that is important as it is used in footnote symbols. However, in a few fonts it is missing even though they are otherwise fairly complete. We therefore use a rather elaborate method and check if the slot has a glyph and if not produce a poor man’s version by using a normal “\*” slightly enlarged and somewhat lowered. The main application for this symbol is in footnote symbols and there it should produce a comparable size and show a similar placement.

```

864 %\DeclareTextSymbol{\textasteriskcentered}{TS1}{42} % that's wanted
865 \DeclareTextCommand \textasteriskcentered{TS1}{%    % and that's needed
866   \iffontchar\font 42 \char42 \else
867   \begingroup\fontencoding{T1}%
868     \fontsize

```

```

869      {\the\dimexpr1.3\dimexpr\f@size pt\relax}%
870      {\f@baselineskip}%
871      \selectfont
872      \raisebox{-0.7ex}{\dimexpr\height-0.7ex}[0pt]{*}%
873    \endgroup
874    \fi
875  }

```

Note that '054 is a comma and '056 is a full stop: these make numbers using oldstyle digits easier to input.

```

876 \DeclareTextSymbol{\textdblhyphen}{TS1}{45}
877 \DeclareTextSymbol{\textfractionsolidus}{TS1}{47}

```

Oldstyle digits.

"30 = 48

```

878 \DeclareTextSymbol{\textzerooldstyle}{TS1}{48}
879 \DeclareTextSymbol{\textoneoldstyle}{TS1}{49}
880 \DeclareTextSymbol{\texttwooldstyle}{TS1}{50}
881 \DeclareTextSymbol{\textthreeoldstyle}{TS1}{51}
882 \DeclareTextSymbol{\textfouroldstyle}{TS1}{52}
883 \DeclareTextSymbol{\textfiveoldstyle}{TS1}{53}
884 \DeclareTextSymbol{\textsixoldstyle}{TS1}{54}
885 \DeclareTextSymbol{\textsevenoldstyle}{TS1}{55}

```

"38 = 56

```

886 \DeclareTextSymbol{\texteightoldstyle}{TS1}{56}
887 \DeclareTextSymbol{\textnineoldstyle}{TS1}{57}

```

More text companion symbols.

```

888 \DeclareTextSymbol{\textlangle}{TS1}{60}
889 \DeclareTextSymbol{\textminus}{TS1}{61}
890 \DeclareTextSymbol{\textrangle}{TS1}{62}

```

"48 = 72

```

891 \DeclareTextSymbol{\textmho}{TS1}{77}

```

The big circle is here to define the command `\textcircled`. Formerly it was taken from the `cmsy` font.

```

892 \DeclareTextSymbol{\textbigcircle}{TS1}{79}
893 \DeclareTextCommand{\textcircled}{TS1}[1]{\hmode\bgroup
894   \oalign{%
895     \hfil \raise .07ex\hbox {\upshape#1}\hfil \cr
896     \char 79 % '117 = "4F
897   }%
898 \egroup}

```

More text companion symbols.

"50 = 80

```

899 \DeclareTextSymbol{\textohm}{TS1}{87}

```

"58 = 88

```

900 \DeclareTextSymbol{\textlbrackdbl}{TS1}{91}
901 \DeclareTextSymbol{\textrbrackdbl}{TS1}{93}
902 \DeclareTextSymbol{\textuparrow}{TS1}{94}
903 \DeclareTextSymbol{\textdownarrow}{TS1}{95}

```

"60 = 96

```
904 \DeclareTextSymbol{\textasciigrave}{TS1}{96}  
905 \DeclareTextSymbol{\textborn}{TS1}{98}  
906 \DeclareTextSymbol{\textdivorced}{TS1}{99}  
907 \DeclareTextSymbol{\textdied}{TS1}{100}
```

"68 = 104

```
908 \DeclareTextSymbol{\textleaf}{TS1}{108}  
909 \DeclareTextSymbol{\textmarried}{TS1}{109}  
910 \DeclareTextSymbol{\textmusicalnote}{TS1}{110}
```

"78 = 120

```
911 \DeclareTextSymbol{\texttildelow}{TS1}{126}
```

This glyph, `\textdblhyphenchar` is hanging, like the hyphenchar of the ec fonts.

```
912 \DeclareTextSymbol{\textdblhyphenchar}{TS1}{127}
```

"80 = 128

```
913 \DeclareTextSymbol{\textasciibreve}{TS1}{128}  
914 \DeclareTextSymbol{\textasciicaron}{TS1}{129}
```

This next glyph is *not* the same as `\textquotedbl`.

```
915 \DeclareTextSymbol{\textacutedbl}{TS1}{130}  
916 \DeclareTextSymbol{\textgravedbl}{TS1}{131}  
917 \DeclareTextSymbol{\textdagger}{TS1}{132}  
918 \DeclareTextSymbol{\textdaggerdbl}{TS1}{133}  
919 \DeclareTextSymbol{\textbardbl}{TS1}{134}  
920 \DeclareTextSymbol{\textperthousand}{TS1}{135}
```

"88 = 136

```
921 \DeclareTextSymbol{\textbullet}{TS1}{136}  
922 \DeclareTextSymbol{\textcelsius}{TS1}{137}  
923 \DeclareTextSymbol{\textdollaroldstyle}{TS1}{138}  
924 \DeclareTextSymbol{\textcentoldstyle}{TS1}{139}  
925 \DeclareTextSymbol{\textflorin}{TS1}{140}  
926 \DeclareTextSymbol{\textcolonmonetary}{TS1}{141}  
927 \DeclareTextSymbol{\textwon}{TS1}{142}  
928 \DeclareTextSymbol{\textnaira}{TS1}{143}
```

"90 = 144

```
929 \DeclareTextSymbol{\textguarani}{TS1}{144}  
930 \DeclareTextSymbol{\textpeso}{TS1}{145}  
931 \DeclareTextSymbol{\textlira}{TS1}{146}  
932 \DeclareTextSymbol{\textrecipe}{TS1}{147}  
933 \DeclareTextSymbol{\textinterrobang}{TS1}{148}  
934 \DeclareTextSymbol{\textinterrobangdown}{TS1}{149}  
935 \DeclareTextSymbol{\textdong}{TS1}{150}  
936 \DeclareTextSymbol{\texttrademark}{TS1}{151}
```

"98 = 152

```
937 \DeclareTextSymbol{\textpertenthousand}{TS1}{152}  
938 \DeclareTextSymbol{\textpilcrow}{TS1}{153}  
939 \DeclareTextSymbol{\textbaht}{TS1}{154}  
940 \DeclareTextSymbol{\textnumero}{TS1}{155}
```



This next name may change. For the following sign we know only a german name, which is abzüglich. The meaning is something like “commercial minus”. An ASCII ersatz is ./ (dot slash dot). The temporary English name is `\textdiscount`.

```
941 \DeclareTextSymbol{\textdiscount}{TS1}{156}
942 \DeclareTextSymbol{\textestimated}{TS1}{157}
943 \DeclareTextSymbol{\textopenbullet}{TS1}{158}
944 \DeclareTextSymbol{\textservicemark}{TS1}{159}
```

"A0 = 160

```
945 \DeclareTextSymbol{\textlquill}{TS1}{160}
946 \DeclareTextSymbol{\textrquill}{TS1}{161}
947 \DeclareTextSymbol{\textcent}{TS1}{162}
948 \DeclareTextSymbol{\textsterling}{TS1}{163}
949 \DeclareTextSymbol{\textcurrency}{TS1}{164}
950 \DeclareTextSymbol{\textyen}{TS1}{165}
951 \DeclareTextSymbol{\textbrokenbar}{TS1}{166}
952 \DeclareTextSymbol{\textsection}{TS1}{167}
```

"A8 = 168

```
953 \DeclareTextSymbol{\textasciidieresis}{TS1}{168}
954 \DeclareTextSymbol{\textcopyright}{TS1}{169}
955 \DeclareTextSymbol{\textordfeminine}{TS1}{170}
956 \DeclareTextSymbol{\textcopyleft}{TS1}{171}
957 \DeclareTextSymbol{\textlnot}{TS1}{172}
```

The meaning of the circled-P is “sound recording copyright”.

```
958 \DeclareTextSymbol{\textcircledP}{TS1}{173}
959 \DeclareTextSymbol{\textregistered}{TS1}{174}
960 \DeclareTextSymbol{\textasciimacron}{TS1}{175}
```

"B0 = 176

```
961 \DeclareTextSymbol{\textdegree}{TS1}{176}
962 \DeclareTextSymbol{\textpm}{TS1}{177}
963 \DeclareTextSymbol{\texttwosuperior}{TS1}{178}
964 \DeclareTextSymbol{\textthreesuperior}{TS1}{179}
965 \DeclareTextSymbol{\textasciicute}{TS1}{180}
966 \DeclareTextSymbol{\textmu}{TS1}{181} % micro sign
967 \DeclareTextSymbol{\textparagraph}{TS1}{182}
968 \DeclareTextSymbol{\textperiodcentered}{TS1}{183}
```

"B8 = 184

```
969 \DeclareTextSymbol{\textreferencemark}{TS1}{184}
970 \DeclareTextSymbol{\textonesuperior}{TS1}{185}
971 \DeclareTextSymbol{\textordmasculine}{TS1}{186}
972 \DeclareTextSymbol{\textsurd}{TS1}{187}
973 \DeclareTextSymbol{\textonequarter}{TS1}{188}
974 \DeclareTextSymbol{\textonehalf}{TS1}{189}
975 \DeclareTextSymbol{\textthreequarters}{TS1}{190}
976 \DeclareTextSymbol{\texteuro}{TS1}{191}
```

"E0 = 208

```
977 \DeclareTextSymbol{\texttimes}{TS1}{214}
```

"F0 = 240

```
978 \DeclareTextSymbol{\textdiv}{TS1}{246}
979 \</TS1>
```

## 1.11 Definitions for the TU encoding

The TU encoding was originally introduced in the contributed package `fontspec` as a Unicode encoding for XeTeX and LuaTeX.

Normally for these engines, the input consists of Unicode characters encoded in UTF-8. There is therefore little need to use the traditional (ASCII) encoding-specific commands

However, sometimes (e.g. for backwards compatibility) it can be useful to access these Unicode characters via such ASCII-based markup. The commands provided here cover the characters in the T1 and TS1 encodings, but specified in Unicode position. Almost all the command names have been mechanically extracted from the `inputenc` UTF-8 support, which is essentially doing a reverse mapping from UTF-8 data to L<sup>A</sup>T<sub>E</sub>X LICR commands.

A few additional names for character which were supported in the original `fontspec` version of this file have also been added, even though they are not currently in the default `inputenc` UTF-8 declarations.

```
980 < *TU>
```

In the base interface the Unicode encoding is always known as TU. But we parameterize the encoding name to allow for modelling differences in Unicode support by different fonts.

```
981 \providecommand\UnicodeEncodingName{TU}
```

As the Unicode encoding, TU, is only currently available with XeTeX or LuaTeX, we detect these engines first, and make adjustments for the differing font loading syntax. For other engines, we issue a warning then abort this file, switching back to T1 encoding.

```
982 \begingroup\expandafter\expandafter\expandafter\endgroup
```

```
983 \expandafter\ifx\csname XeTeXrevision\endcsname\relax
```

```
984 \begingroup\expandafter\expandafter\expandafter\endgroup
```

```
985 \expandafter\ifx\csname directlua\endcsname\relax
```

Not LuaTeX or XeTeX, abort with a warning.

```
986 \PackageWarningNoLine{fontenc}
```

```
987 {\UnicodeEncodingName\space
```

```
988 encoding is only available with XeTeX and LuaTeX.\MessageBreak
```

```
989 Defaulting to T1 encoding}
```

```
990 \def\encodingdefault{T1}
```

```
991 \expandafter\expandafter\expandafter\endinput
```

```
992 \else
```

LuaTeX. For LuaTeX 1.10+, define a Lua function to disable any handing by the font code. Otherwise we reload the font without TeX ligatures.

```
993 \def\UnicodeFontTeXLigatures{+tlig;}
```

```
994 \ifnum\luatexversion<110
```

```
995 \def\reserved@a#1{%
```

```
996 \def\@remove@tlig##1{\@remove@tlig@##1\@nil#1\@nil\relax}
```

```
997 \def\@remove@tlig@##1#1{\@remove@tlig@##1}}
```

```
998 \edef\reserved@b{\detokenize{+tlig;}}
```

```
999 \expandafter\reserved@a\expandafter{\reserved@b}
```

```
1000 \def\@remove@tlig@##1\@nil#2\relax{#1}
```

```

1001 \def\remove@tlig#1{%
1002 \begingroup
1003 \font\remove@tlig
1004 \expandafter\@remove@tlig\expandafter{\fontname\font}%
1005 \remove@tlig
1006 \char#1\relax
1007 \endgroup
1008 }
1009 \else
1010 \newprotectedluacmd\@remove@tlig@@@

```

Now we can define the function. Mostly we just have to insert a protected glyph node, which is a glyph node with subtype 256. But we have to keep track of the current mode to avoid inserting the glyph into a vlist.

```

1011 \now@and@everyjob{\directlua{
1012   local rawchar_func = token.create'\@remove@tlig@@@'.index
1013   local forcehmode = tex.forcehmode
1014   local put_next = token.put_next
1015   local glyph_id = node.id'glyph'
1016   local rawchar_token = token.new(rawchar_func, token.command_id'lua_call')
1017   lua.get_functions_table()[rawchar_func] = function()
1018     local mode = tex.nest.top.mode
1019     if mode == 1 or mode == -1 then
1020       put_next(rawchar_token)
1021       return forcehmode(true)
1022     end
1023     local n = node.new(glyph_id, 256)
1024     n.font = font.current()
1025     n.char = token.scan_int()
1026     return node.write(n)
1027   end
1028 }}

```

Now `\remove@tlig` can be implemented almost as in XeTeX.

```

1029 \def\remove@tlig#1{\@remove@tlig@@@#1\relax}
1030 \fi
1031 \fi
1032 \else
1033 XeTeX
1034 \def\UnicodeFontTeXLigatures{mapping=tex-text;}
1035 \def\remove@tlig#1{\XeTeXglyph\numexpr\XeTeXcharglyph#1\relax}
1036 \fi
1037 \def\UnicodeFontFile#1#2{"[#1]:#2"}
1038 \def\UnicodeFontName#1#2{"#1:#2"}
1039 Declare the encoding
1040 \DeclareFontEncoding\UnicodeEncodingName{}{}
1041 Declare accent command to use a postpended combining character rather than the
TeX \accent primitive
1039 \def\add@unicode@accent#1#2{%
1040 \if\relax\detokenize{#2}\relax~^a0\else#2\fi
1041 \char#1\relax}

```

In its original implementation `\DeclareUnicodeAccent` was given 3 arguments (with second the “Unicode encoding” a.k.a., `\UnicodeEncodingName`) while in other places, e.g., `\DeclareUnicodeComposite`, we always made encoding implicit. So we now change it here to implicit too so that the interfaces become a bit more consistent. To avoid making that a breaking change (even though it only affects two packages on CTAN) we test for #2 being `\UnicodeEncodingName`. This would not catch if somebody used `\DeclareUnicodeAccent{=}{TU-sub}{“0304}` but that fortunately hasn’t happened. With the implicit argument you would need to change `\UnicodeEncodingName` instead, as you have to do anyway for the other interface commands.

```

1042 \def\DeclareUnicodeAccent#1#2{%
1043   \edef\reserved@a{#2}%
1044   \edef\reserved@b{\UnicodeEncodingName}%
1045   \ifx\reserved@a\reserved@b
1046     \def\reserved@a{\DeclareUnicodeAccent@{#1}}%
1047   \else
1048     \def\reserved@a{\DeclareUnicodeAccent@{#1}\UnicodeEncodingName}%
1049   \fi
1050   \reserved@a{#2}%
1051 }
1052 \def\DeclareUnicodeAccent@#1#2#3{%
1053   \DeclareTextCommand{#1}{#2}{\add@unicode@accent{#3}}%
1054 }

```

Wrapper around `\DeclareTextCompositeCommand` that uses the declared composite if it exists in the current font or falls back to the default definition for the TU accent if not.

```

1055 {
1056   \catcode\z@=11\relax
1057   \gdef\DeclareUnicodeComposite#1#2#3{%
1058     \def\reserved@a##1##2{%
1059       \DeclareTextCompositeCommand#1\UnicodeEncodingName{#2}{%
1060         \iffontchar\font#3 ##2%
1061         \else ##1\fi}}%
1062     \expandafter\expandafter\expandafter\extract@default@composite
1063     \cename\UnicodeEncodingName\string#1\endcsname{#2}\@nil
1064     \bgroup
1065       \lccode\z@#3 %
1066       \lowercase{\egroup
1067         \expandafter\reserved@a\expandafter{\reserved@b}{^^@}}}%
1068   }
1069   \def\extract@default@composite#1{%
1070     \ifx\@text@composite#1%
1071       \expandafter\extract@default@composite@a
1072     \else
1073       \expandafter\extract@default@composite@b\expandafter#1%
1074     \fi}
1075   \def\extract@default@composite@a#1\@text@composite#2\@nil{%
1076     \def\reserved@b{#2}}
1077   \def\extract@default@composite@b#1#2\@nil{%
1078     \def\reserved@b{#1#2}}

```

Next two commands are simply syntactic sugar to go with the other `\DeclareUnicode...` declarations.

```

1079 \def\DeclareUnicodeSymbol#1{\DeclareTextSymbol{#1}{\UnicodeEncodingName}}
1080 \def\DeclareUnicodeCommand#1{\DeclareTextCommand{#1}{\UnicodeEncodingName}}

1081 \DeclareUnicodeCommand\textquotesingle {\remove@tlig{"0027}}
1082 \DeclareUnicodeCommand\textasciigrave {\remove@tlig{"0060}}
1083 \DeclareUnicodeCommand\textquotedbl {\remove@tlig{"0022}}

1084 \DeclareUnicodeSymbol{\textdollar} {"0024}
1085 \DeclareUnicodeSymbol{\textless} {"003C}
1086 \DeclareUnicodeSymbol{\textgreater} {"003E}
1087 \DeclareUnicodeSymbol{\textbackslash} {"005C}
1088 \DeclareUnicodeSymbol{\textasciicircum} {"005E}
1089 \DeclareUnicodeSymbol{\textunderscore} {"005F}
1090 \DeclareUnicodeSymbol{\textbraceleft} {"007B}
1091 \DeclareUnicodeSymbol{\textbar} {"007C}
1092 \DeclareUnicodeSymbol{\textbraceright} {"007D}
1093 \DeclareUnicodeSymbol{\textasciitilde} {"007E}
1094 \DeclareUnicodeSymbol{\textexclamdown} {"00A1}
1095 \DeclareUnicodeSymbol{\textcent} {"00A2}
1096 \DeclareUnicodeSymbol{\textsterling} {"00A3}
1097 \DeclareUnicodeSymbol{\textcurrency} {"00A4}
1098 \DeclareUnicodeSymbol{\textyen} {"00A5}
1099 \DeclareUnicodeSymbol{\textbrokenbar} {"00A6}
1100 \DeclareUnicodeSymbol{\textsection} {"00A7}
1101 \DeclareUnicodeSymbol{\textasciidieresis} {"00A8}
1102 \DeclareUnicodeSymbol{\textcopyright} {"00A9}
1103 \DeclareUnicodeSymbol{\textordfeminine} {"00AA}

1104 \DeclareUnicodeSymbol{\guillemetleft} {"00AB}
1105 % old Adobe name
1106 \DeclareUnicodeSymbol{\guillemotleft} {"00AB}

1107 \DeclareUnicodeSymbol{\textlnot} {"00AC}
1108 \DeclareUnicodeSymbol{\textregistered} {"00AE}
1109 \DeclareUnicodeSymbol{\textasciimacron} {"00AF}
1110 \DeclareUnicodeSymbol{\textdegree} {"00B0}
1111 \DeclareUnicodeSymbol{\textpm} {"00B1}
1112 \DeclareUnicodeSymbol{\texttwosuperior} {"00B2}
1113 \DeclareUnicodeSymbol{\textthreesuperior} {"00B3}
1114 \DeclareUnicodeSymbol{\textasciiacute} {"00B4}
1115 \DeclareUnicodeSymbol{\textmu} {"00B5}
1116 \DeclareUnicodeSymbol{\textparagraph} {"00B6}
1117 \DeclareUnicodeSymbol{\textperiodcentered} {"00B7}
1118 \DeclareUnicodeSymbol{\textonesuperior} {"00B9}
1119 \DeclareUnicodeSymbol{\textordmasculine} {"00BA}

1120 \DeclareUnicodeSymbol{\guillemetright} {"00BB}
1121 % old Adobe name
1122 \DeclareUnicodeSymbol{\guillemotright} {"00BB}

1123 \DeclareUnicodeSymbol{\textonequarter} {"00BC}
1124 \DeclareUnicodeSymbol{\textonehalf} {"00BD}
1125 \DeclareUnicodeSymbol{\textthreequarters} {"00BE}
1126 \DeclareUnicodeSymbol{\textquestiondown} {"00BF}
1127 \DeclareUnicodeSymbol{\AE} {"00C6}
1128 \DeclareUnicodeSymbol{\DH} {"00D0}
1129 \DeclareUnicodeSymbol{\texttimes} {"00D7}

```

```

1130 \DeclareUnicodeSymbol{\0} {"00D8}
1131 \DeclareUnicodeSymbol{\TH} {"00DE}
1132 \DeclareUnicodeSymbol{\ss} {"00DF}
1133 \DeclareUnicodeSymbol{\ae} {"00E6}
1134 \DeclareUnicodeSymbol{\dh} {"00F0}
1135 \DeclareUnicodeSymbol{\textdiv} {"00F7}
1136 \DeclareUnicodeSymbol{\o} {"00F8}
1137 \DeclareUnicodeSymbol{\th} {"00FE}
1138 \DeclareUnicodeSymbol{\DJ} {"0110}
1139 \DeclareUnicodeSymbol{\dj} {"0111}
1140 \DeclareUnicodeSymbol{\i} {"0131}
1141 \DeclareUnicodeSymbol{\IJ} {"0132}
1142 \DeclareUnicodeSymbol{\ij} {"0133}
1143 \DeclareUnicodeSymbol{\L} {"0141}
1144 \DeclareUnicodeSymbol{\l} {"0142}
1145 \DeclareUnicodeSymbol{\NG} {"014A}
1146 \DeclareUnicodeSymbol{\ng} {"014B}
1147 \DeclareUnicodeSymbol{\OE} {"0152}
1148 \DeclareUnicodeSymbol{\oe} {"0153}
1149 \DeclareUnicodeSymbol{\textflorin} {"0192}
1150 \DeclareUnicodeSymbol{\j} {"0237}
1151 \DeclareUnicodeSymbol{\textasciicaron} {"02C7}
1152 \DeclareUnicodeSymbol{\textasciibreve} {"02D8}
1153 \DeclareUnicodeSymbol{\textacutedbl} {"02DD}
1154 \DeclareUnicodeSymbol{\textgravedbl} {"02F5}
1155 \DeclareUnicodeSymbol{\texttildelow} {"02F7}
1156 \DeclareUnicodeSymbol{\textbaht} {"0E3F}
1157 \DeclareUnicodeSymbol{\SS} {"1E9E}
1158 \DeclareUnicodeSymbol{\textcompwordmark} {"200C}

1159 %\DeclareUnicodeSymbol{\textnonbreakinghyphen} {"2011}
1160 %\DeclareUnicodeSymbol{\textfiguredash} {"2012}
1161 \DeclareUnicodeSymbol{\textendash} {"2013}
1162 \DeclareUnicodeSymbol{\textemdash} {"2014}
1163 %\DeclareUnicodeSymbol{\texthorizontalbar} {"2015}

1164 \DeclareUnicodeCommand{\textnonbreakinghyphen}
1165 {\iffontchar\font "2011 \char "2011 \else \mbox{-}\nobreak\hskip\z@ \fi}
1166 \DeclareUnicodeCommand{\textfiguredash}
1167 {\iffontchar\font "2012 \char "2012 \else \char "2013 \fi}
1168 \DeclareUnicodeCommand{\texthorizontalbar}
1169 {\iffontchar\font "2015 \char "2015 \else \char "2014 \fi}

1170 \DeclareUnicodeSymbol{\textbardbl} {"2016}
1171 \DeclareUnicodeSymbol{\textquotelleft} {"2018}
1172 \DeclareUnicodeSymbol{\textquoteright} {"2019}
1173 \DeclareUnicodeSymbol{\quotesinglbase} {"201A}
1174 \DeclareUnicodeSymbol{\textquotedblleft} {"201C}
1175 \DeclareUnicodeSymbol{\textquotedblright} {"201D}
1176 \DeclareUnicodeSymbol{\quotedblbase} {"201E}

```

Unfortunately some fonts do not implement "2011, "2012 and/or "2015 (including the L<sup>A</sup>T<sub>E</sub>X default fonts for Unicode engines) so we provide some approximations if the glyph is missing, like we do for OT1 and T1.

The `\nobreak\hskip\z@` is there to prevent a break after the hyphen but allow later breaks in the remainder of the word.

```

1177 \DeclareUnicodeSymbol{\textdagger} {"2020}
1178 \DeclareUnicodeSymbol{\textdaggerdbl} {"2021}
1179 \DeclareUnicodeSymbol{\textbullet} {"2022}
1180 \DeclareUnicodeSymbol{\textellipsis} {"2026}
1181 \DeclareUnicodeSymbol{\textperthousand} {"2030}
1182 \DeclareUnicodeSymbol{\textpertenthousand} {"2031}
1183 \DeclareUnicodeSymbol{\guilsinglleft} {"2039}
1184 \DeclareUnicodeSymbol{\guilsinglright} {"203A}
1185 \DeclareUnicodeSymbol{\textreferencemark} {"203B}
1186 \DeclareUnicodeSymbol{\textinterrobang} {"203D}
1187 \DeclareUnicodeSymbol{\textfractionsolidus} {"2044}
1188 \DeclareUnicodeSymbol{\textlquill} {"2045}
1189 \DeclareUnicodeSymbol{\textrquill} {"2046}
1190 \DeclareUnicodeSymbol{\textdiscount} {"2052}
1191 \DeclareUnicodeSymbol{\textcolonmonetary} {"20A1}
1192 \DeclareUnicodeSymbol{\textlira} {"20A4}
1193 \DeclareUnicodeSymbol{\textnaira} {"20A6}
1194 \DeclareUnicodeSymbol{\textwon} {"20A9}
1195 \DeclareUnicodeSymbol{\textdong} {"20AB}
1196 \DeclareUnicodeSymbol{\texteuro} {"20AC}
1197 \DeclareUnicodeSymbol{\textpeso} {"20B1}
1198 \DeclareUnicodeSymbol{\textcelsius} {"2103}
1199 \DeclareUnicodeSymbol{\textnumero} {"2116}
1200 \DeclareUnicodeSymbol{\textcircledP} {"2117}
1201 \DeclareUnicodeSymbol{\textrecipe} {"211E}
1202 \DeclareUnicodeSymbol{\textservicemark} {"2120}
1203 \DeclareUnicodeSymbol{\texttrademark} {"2122}
1204 \DeclareUnicodeSymbol{\textohm} {"2126}
1205 \DeclareUnicodeSymbol{\textmho} {"2127}
1206 \DeclareUnicodeSymbol{\textestimated} {"212E}
1207 \DeclareUnicodeSymbol{\textleftarrow} {"2190}
1208 \DeclareUnicodeSymbol{\textuparrow} {"2191}
1209 \DeclareUnicodeSymbol{\textrightarrow} {"2192}
1210 \DeclareUnicodeSymbol{\textdownarrow} {"2193}
1211 \DeclareUnicodeSymbol{\textminus} {"2212}

```

1212

```

1213 \DeclareUnicodeSymbol{\Hwithstroke} {"0126}
1214 \DeclareUnicodeSymbol{\hwithstroke} {"0127}

```

Not all fonts have U+2217 but using U+002A requires some adjustment.

```

1215 \DeclareUnicodeCommand{\textasteriskcentered}{%
1216   \iffontchar\font"2217 \char"2217 \else
1217     \begingroup
1218       \fontsize
1219       {\the\dimexpr1.3\dimexpr\fontsize pt\relax}%
1220       {\f@baselineskip}%
1221       \selectfont
1222       \raisebox{-0.7ex}{\dimexpr\height-0.7ex}[0pt]{*}%
1223     \endgroup
1224   \fi
1225 }

1226 \DeclareUnicodeSymbol{\textsurd} {"221A}
1227 \DeclareUnicodeSymbol{\textlangle} {"2329}

```

```

1228 \DeclareUnicodeSymbol{\textrangle}      {"232A}
1229 \DeclareUnicodeSymbol{\textblank}      {"2422}
1230 \DeclareUnicodeSymbol{\textvisiblespace} {"2423}
1231 \DeclareUnicodeSymbol{\textopenbullet}  {"25E6}
1232 \DeclareUnicodeSymbol{\textbigcircle}   {"25EF}
1233 \DeclareUnicodeSymbol{\textmusicalnote} {"266A}
1234 \DeclareUnicodeSymbol{\textmarried}     {"26AD}
1235 \DeclareUnicodeSymbol{\textdivorced}    {"26AE}
1236 \DeclareUnicodeSymbol{\textinterrobangdown} {"2E18}

```

Accents must be declared before the composites that use them.

```

1237 \DeclareUnicodeAccent{\`}{0300}
1238 \DeclareUnicodeAccent{\'}{"0301}
1239 \DeclareUnicodeAccent{\^}{0302}
1240 \DeclareUnicodeAccent{\~}{0303}
1241 \DeclareUnicodeAccent{\=}{0304}
1242 \DeclareUnicodeAccent{\u}{0306}
1243 \DeclareUnicodeAccent{\.}{0307}
1244 \DeclareUnicodeAccent{\"}{"0308}
1245 \DeclareUnicodeAccent{\r}{030A}
1246 \DeclareUnicodeAccent{\H}{030B}
1247 \DeclareUnicodeAccent{\v}{030C}
1248 \DeclareUnicodeAccent{\b}{0332}
1249 \DeclareUnicodeAccent{\d}{0323}
1250 \DeclareUnicodeAccent{\c}{0327}
1251 \DeclareUnicodeAccent{\k}{0328}

```

The odd one out:

```

1252 \DeclareUnicodeCommand\textcommabelow[1]
1253   {\hmode\bgroup\ooalign{\null#1\crcr\hidewidth\raise-.31ex
1254     \hbox{\check@mathfonts\fontsize\ssf@size\z@
1255       \math@fontsfalse\selectfont,}\hidewidth}\egroup}

1256 \DeclareUnicodeComposite{\`}{005E}
1257 \DeclareUnicodeComposite{\~}{007E}

1258 \DeclareUnicodeComposite{\`}{A}{00C0}
1259 \DeclareUnicodeComposite{\'}{A}{00C1}
1260 \DeclareUnicodeComposite{\^}{A}{00C2}
1261 \DeclareUnicodeComposite{\~}{A}{00C3}
1262 \DeclareUnicodeComposite{\"}{A}{00C4}
1263 \DeclareUnicodeComposite{\r}{A}{00C5}
1264 \DeclareUnicodeComposite{\c}{C}{00C7}
1265 \DeclareUnicodeComposite{\`}{E}{00C8}
1266 \DeclareUnicodeComposite{\'}{E}{00C9}
1267 \DeclareUnicodeComposite{\^}{E}{00CA}
1268 \DeclareUnicodeComposite{\"}{E}{00CB}
1269 \DeclareUnicodeComposite{\`}{I}{00CC}
1270 \DeclareUnicodeComposite{\'}{I}{00CD}
1271 \DeclareUnicodeComposite{\^}{I}{00CE}
1272 \DeclareUnicodeComposite{\"}{I}{00CF}
1273 \DeclareUnicodeComposite{\~}{N}{00D1}
1274 \DeclareUnicodeComposite{\`}{O}{00D2}
1275 \DeclareUnicodeComposite{\'}{O}{00D3}
1276 \DeclareUnicodeComposite{\^}{O}{00D4}
1277 \DeclareUnicodeComposite{\~}{O}{00D5}

```



1278	\DeclareUnicodeComposite{"}	{0}{00D6}
1279	\DeclareUnicodeComposite{'}	{U}{00D9}
1280	\DeclareUnicodeComposite{'}	{U}{00DA}
1281	\DeclareUnicodeComposite{^}	{U}{00DB}
1282	\DeclareUnicodeComposite{"}	{U}{00DC}
1283	\DeclareUnicodeComposite{'}	{Y}{00DD}
1284	\DeclareUnicodeComposite{'}	{a}{00E0}
1285	\DeclareUnicodeComposite{'}	{a}{00E1}
1286	\DeclareUnicodeComposite{^}	{a}{00E2}
1287	\DeclareUnicodeComposite{~}	{a}{00E3}
1288	\DeclareUnicodeComposite{"}	{a}{00E4}
1289	\DeclareUnicodeComposite{r}	{a}{00E5}
1290	\DeclareUnicodeComposite{c}	{c}{00E7}
1291	\DeclareUnicodeComposite{'}	{e}{00E8}
1292	\DeclareUnicodeComposite{'}	{e}{00E9}
1293	\DeclareUnicodeComposite{^}	{e}{00EA}
1294	\DeclareUnicodeComposite{"}	{e}{00EB}
1295	\DeclareUnicodeComposite{'}	\i {00EC}
1296	\DeclareUnicodeComposite{'}	{i}{00EC}
1297	\DeclareUnicodeComposite{'}	\i {00ED}
1298	\DeclareUnicodeComposite{'}	{i}{00ED}
1299	\DeclareUnicodeComposite{^}	\i {00EE}
1300	\DeclareUnicodeComposite{^}	{i}{00EE}
1301	\DeclareUnicodeComposite{"}	\i {00EF}
1302	\DeclareUnicodeComposite{"}	{i}{00EF}
1303	\DeclareUnicodeComposite{~}	{n}{00F1}
1304	\DeclareUnicodeComposite{'}	{o}{00F2}
1305	\DeclareUnicodeComposite{'}	{o}{00F3}
1306	\DeclareUnicodeComposite{^}	{o}{00F4}
1307	\DeclareUnicodeComposite{~}	{o}{00F5}
1308	\DeclareUnicodeComposite{"}	{o}{00F6}
1309	\DeclareUnicodeComposite{'}	{u}{00F9}
1310	\DeclareUnicodeComposite{'}	{u}{00FA}
1311	\DeclareUnicodeComposite{^}	{u}{00FB}
1312	\DeclareUnicodeComposite{"}	{u}{00FC}
1313	\DeclareUnicodeComposite{'}	{y}{00FD}
1314	\DeclareUnicodeComposite{"}	{y}{00FF}
1315	\DeclareUnicodeComposite{=}	{A}{0100}
1316	\DeclareUnicodeComposite{=}	{a}{0101}
1317	\DeclareUnicodeComposite{u}	{A}{0102}
1318	\DeclareUnicodeComposite{u}	{a}{0103}
1319	\DeclareUnicodeComposite{k}	{A}{0104}
1320	\DeclareUnicodeComposite{k}	{a}{0105}
1321	\DeclareUnicodeComposite{'}	{C}{0106}
1322	\DeclareUnicodeComposite{'}	{c}{0107}
1323	\DeclareUnicodeComposite{^}	{C}{0108}
1324	\DeclareUnicodeComposite{^}	{c}{0109}
1325	\DeclareUnicodeComposite{.}	{C}{010A}
1326	\DeclareUnicodeComposite{.}	{c}{010B}
1327	\DeclareUnicodeComposite{v}	{C}{010C}
1328	\DeclareUnicodeComposite{v}	{c}{010D}
1329	\DeclareUnicodeComposite{v}	{D}{010E}
1330	\DeclareUnicodeComposite{v}	{d}{010F}
1331	\DeclareUnicodeComposite{=}	{E}{0112}

1332	\DeclareUnicodeComposite{=}	{e}{"0113}
1333	\DeclareUnicodeComposite{u}	{E}{"0114}
1334	\DeclareUnicodeComposite{u}	{e}{"0115}
1335	\DeclareUnicodeComposite{.}	{E}{"0116}
1336	\DeclareUnicodeComposite{.}	{e}{"0117}
1337	\DeclareUnicodeComposite{k}	{E}{"0118}
1338	\DeclareUnicodeComposite{k}	{e}{"0119}
1339	\DeclareUnicodeComposite{v}	{E}{"011A}
1340	\DeclareUnicodeComposite{v}	{e}{"011B}
1341	\DeclareUnicodeComposite{^}	{G}{"011C}
1342	\DeclareUnicodeComposite{^}	{g}{"011D}
1343	\DeclareUnicodeComposite{u}	{G}{"011E}
1344	\DeclareUnicodeComposite{u}	{g}{"011F}
1345	\DeclareUnicodeComposite{.}	{G}{"0120}
1346	\DeclareUnicodeComposite{.}	{g}{"0121}
1347	\DeclareUnicodeComposite{c}	{G}{"0122}
1348	\DeclareUnicodeComposite{c}	{g}{"0123}
1349	\DeclareUnicodeComposite{^}	{H}{"0124}
1350	\DeclareUnicodeComposite{^}	{h}{"0125}
1351	\DeclareUnicodeComposite{~}	{I}{"0128}
1352	\DeclareUnicodeComposite{~}	\i {"0129}
1353	\DeclareUnicodeComposite{~}	{i}{"0129}
1354	\DeclareUnicodeComposite{=}	{I}{"012A}
1355	\DeclareUnicodeComposite{=}	\i {"012B}
1356	\DeclareUnicodeComposite{=}	{i}{"012B}
1357	\DeclareUnicodeComposite{u}	{I}{"012C}
1358	\DeclareUnicodeComposite{u}	\i {"012D}
1359	\DeclareUnicodeComposite{u}	{i}{"012D}
1360	\DeclareUnicodeComposite{k}	{I}{"012E}
1361	\DeclareUnicodeComposite{k}	\i {"012F}
1362	\DeclareUnicodeComposite{k}	{i}{"012F}
1363	\DeclareUnicodeComposite{.}	{I}{"0130}
1364	\DeclareUnicodeComposite{^}	{J}{"0134}
1365	\DeclareUnicodeComposite{^}	\j {"0135}
1366	\DeclareUnicodeComposite{^}	{j}{"0135}
1367	\DeclareUnicodeComposite{c}	{K}{"0136}
1368	\DeclareUnicodeComposite{c}	{k}{"0137}
1369	\DeclareUnicodeComposite{'}	{L}{"0139}
1370	\DeclareUnicodeComposite{'}	{l}{"013A}
1371	\DeclareUnicodeComposite{c}	{L}{"013B}
1372	\DeclareUnicodeComposite{c}	{l}{"013C}
1373	\DeclareUnicodeComposite{v}	{L}{"013D}
1374	\DeclareUnicodeComposite{v}	{l}{"013E}
1375	\DeclareUnicodeComposite{'}	{N}{"0143}
1376	\DeclareUnicodeComposite{'}	{n}{"0144}
1377	\DeclareUnicodeComposite{c}	{N}{"0145}
1378	\DeclareUnicodeComposite{c}	{n}{"0146}
1379	\DeclareUnicodeComposite{v}	{N}{"0147}
1380	\DeclareUnicodeComposite{v}	{n}{"0148}
1381	\DeclareUnicodeComposite{=}	{O}{"014C}
1382	\DeclareUnicodeComposite{=}	{o}{"014D}
1383	\DeclareUnicodeComposite{u}	{O}{"014E}
1384	\DeclareUnicodeComposite{u}	{o}{"014F}
1385	\DeclareUnicodeComposite{H}	{O}{"0150}

1386	\DeclareUnicodeComposite{\H}	{o}{\0151}
1387	\DeclareUnicodeComposite{\'}	{R}{\0154}
1388	\DeclareUnicodeComposite{\'}	{r}{\0155}
1389	\DeclareUnicodeComposite{\c}	{R}{\0156}
1390	\DeclareUnicodeComposite{\c}	{r}{\0157}
1391	\DeclareUnicodeComposite{\v}	{R}{\0158}
1392	\DeclareUnicodeComposite{\v}	{r}{\0159}
1393	\DeclareUnicodeComposite{\'}	{S}{\015A}
1394	\DeclareUnicodeComposite{\'}	{s}{\015B}
1395	\DeclareUnicodeComposite{\^}	{S}{\015C}
1396	\DeclareUnicodeComposite{\^}	{s}{\015D}
1397	\DeclareUnicodeComposite{\c}	{S}{\015E}
1398	\DeclareUnicodeComposite{\c}	{s}{\015F}
1399	\DeclareUnicodeComposite{\v}	{S}{\0160}
1400	\DeclareUnicodeComposite{\v}	{s}{\0161}
1401	\DeclareUnicodeComposite{\c}	{T}{\0162}
1402	\DeclareUnicodeComposite{\c}	{t}{\0163}
1403	\DeclareUnicodeComposite{\v}	{T}{\0164}
1404	\DeclareUnicodeComposite{\v}	{t}{\0165}
1405	\DeclareUnicodeComposite{\~}	{U}{\0168}
1406	\DeclareUnicodeComposite{\~}	{u}{\0169}
1407	\DeclareUnicodeComposite{\=}	{U}{\016A}
1408	\DeclareUnicodeComposite{\=}	{u}{\016B}
1409	\DeclareUnicodeComposite{\u}	{U}{\016C}
1410	\DeclareUnicodeComposite{\u}	{u}{\016D}
1411	\DeclareUnicodeComposite{\r}	{U}{\016E}
1412	\DeclareUnicodeComposite{\r}	{u}{\016F}
1413	\DeclareUnicodeComposite{\H}	{U}{\0170}
1414	\DeclareUnicodeComposite{\H}	{u}{\0171}
1415	\DeclareUnicodeComposite{\k}	{U}{\0172}
1416	\DeclareUnicodeComposite{\k}	{u}{\0173}
1417	\DeclareUnicodeComposite{\^}	{W}{\0174}
1418	\DeclareUnicodeComposite{\^}	{w}{\0175}
1419	\DeclareUnicodeComposite{\^}	{Y}{\0176}
1420	\DeclareUnicodeComposite{\^}	{y}{\0177}
1421	\DeclareUnicodeComposite{\"	{Y}{\0178}
1422	\DeclareUnicodeComposite{\'}	{Z}{\0179}
1423	\DeclareUnicodeComposite{\'}	{z}{\017A}
1424	\DeclareUnicodeComposite{\.}	{Z}{\017B}
1425	\DeclareUnicodeComposite{\.}	{z}{\017C}
1426	\DeclareUnicodeComposite{\v}	{Z}{\017D}
1427	\DeclareUnicodeComposite{\v}	{z}{\017E}
1428	\DeclareUnicodeComposite{\v}	{A}{\01CD}
1429	\DeclareUnicodeComposite{\v}	{a}{\01CE}
1430	\DeclareUnicodeComposite{\v}	{I}{\01CF}
1431	\DeclareUnicodeComposite{\v}	\i {\01D0}
1432	\DeclareUnicodeComposite{\v}	{i}{\01D0}
1433	\DeclareUnicodeComposite{\v}	{O}{\01D1}
1434	\DeclareUnicodeComposite{\v}	{o}{\01D2}
1435	\DeclareUnicodeComposite{\v}	{U}{\01D3}
1436	\DeclareUnicodeComposite{\v}	{u}{\01D4}
1437	\DeclareUnicodeComposite{\'}	\AE{\01FC}
1438	\DeclareUnicodeComposite{\'}	{E}{\01FC}

```

1439 \DeclareUnicodeComposite{\'} \ae{"01FD}
1440 \DeclareUnicodeComposite{\'} {æ}{"01FD}
1441 \DeclareUnicodeComposite{\=} \AE{"01E2}
1442 \DeclareUnicodeComposite{\=} {E}{"01E2}
1443 \DeclareUnicodeComposite{\=} \ae{"01E3}
1444 \DeclareUnicodeComposite{\=} {æ}{"01E3}
1445 \DeclareUnicodeComposite{\v} {G}{"01E6}
1446 \DeclareUnicodeComposite{\v} {g}{"01E7}
1447 \DeclareUnicodeComposite{\v} {K}{"01E8}
1448 \DeclareUnicodeComposite{\v} {k}{"01E9}
1449 \DeclareUnicodeComposite{\k} {O}{"01EA}
1450 \DeclareUnicodeComposite{\k} {o}{"01EB}
1451 \DeclareUnicodeComposite{\v} \j {"01F0}
1452 \DeclareUnicodeComposite{\v} {j}{"01F0}
1453 \DeclareUnicodeComposite{\'} {G}{"01F4}
1454 \DeclareUnicodeComposite{\'} {g}{"01F5}
1455 \DeclareUnicodeComposite{\textcommabelow}{S}{"0218}
1456 \DeclareUnicodeComposite{\textcommabelow}{s}{"0219}
1457 \DeclareUnicodeComposite{\textcommabelow}{T}{"021A}
1458 \DeclareUnicodeComposite{\textcommabelow}{t}{"021B}
1459 \DeclareUnicodeComposite{\=} {Y}{"0232}
1460 \DeclareUnicodeComposite{\=} {y}{"0233}
1461 \DeclareUnicodeComposite{\.} {B}{"1E02}
1462 \DeclareUnicodeComposite{\.} {b}{"1E03}
1463 \DeclareUnicodeComposite{\d} {B}{"1E04}
1464 \DeclareUnicodeComposite{\d} {b}{"1E05}
1465 \DeclareUnicodeComposite{\d} {D}{"1E0C}
1466 \DeclareUnicodeComposite{\d} {d}{"1E0D}
1467 \DeclareUnicodeComposite{\=} {G}{"1E20}
1468 \DeclareUnicodeComposite{\=} {g}{"1E21}
1469 \DeclareUnicodeComposite{\d} {H}{"1E24}
1470 \DeclareUnicodeComposite{\d} {h}{"1E25}
1471 \DeclareUnicodeComposite{\d} {K}{"1E32}
1472 \DeclareUnicodeComposite{\d} {k}{"1E33}
1473 \DeclareUnicodeComposite{\d} {L}{"1E36}
1474 \DeclareUnicodeComposite{\d} {l}{"1E37}
1475 \DeclareUnicodeComposite{\d} {M}{"1E42}
1476 \DeclareUnicodeComposite{\d} {m}{"1E43}
1477 \DeclareUnicodeComposite{\d} {N}{"1E46}
1478 \DeclareUnicodeComposite{\d} {n}{"1E47}
1479 \DeclareUnicodeComposite{\d} {R}{"1E5A}
1480 \DeclareUnicodeComposite{\d} {r}{"1E5B}
1481 \DeclareUnicodeComposite{\d} {S}{"1E62}
1482 \DeclareUnicodeComposite{\d} {s}{"1E63}
1483 \DeclareUnicodeComposite{\d} {T}{"1E6C}
1484 \DeclareUnicodeComposite{\d} {t}{"1E6D}
1485 \DeclareUnicodeComposite{\d} {V}{"1E7E}
1486 \DeclareUnicodeComposite{\d} {v}{"1E7F}
1487 \DeclareUnicodeComposite{\d} {W}{"1E88}
1488 \DeclareUnicodeComposite{\d} {w}{"1E89}
1489 \DeclareUnicodeComposite{\d} {Z}{"1E92}
1490 \DeclareUnicodeComposite{\d} {z}{"1E93}
1491 \DeclareUnicodeComposite{\d} {A}{"1EA0}
1492 \DeclareUnicodeComposite{\d} {a}{"1EA1}

```

```

1493 \DeclareUnicodeComposite{\d}           {E}{"1EB8}
1494 \DeclareUnicodeComposite{\d}           {e}{"1EB9}
1495 \DeclareUnicodeComposite{\d}           {I}{"1ECA}
1496 \DeclareUnicodeComposite{\d}           {i}{"1ECB}
1497 \DeclareUnicodeComposite{\d}           {O}{"1ECC}
1498 \DeclareUnicodeComposite{\d}           {o}{"1ECD}
1499 \DeclareUnicodeComposite{\d}           {U}{"1EE4}
1500 \DeclareUnicodeComposite{\d}           {u}{"1EE5}
1501 \DeclareUnicodeComposite{\d}           {Y}{"1EF4}
1502 \DeclareUnicodeComposite{\d}           {y}{"1EF5}
1503 </TU>

```

## 2 Package files

This file now also contains some packages that provide access to the more specialised encodings.

## 2.1 The fontenc package

This package allows authors to specify which encodings they will use. For each encoding `F00`, the package looks to see if the encoding `F00` has already been declared. If it has not, the file `fooenc.def` is loaded. The default encoding is set to be `F00`.

In addition the package at the moment contains extra code to extend the `\@uclclist` (list of upper/lower case pairs) for encodings that involve cyrillic characters. THIS IS A TEMPORARY SOLUTION and will not stay this way forever (or so we hope) but right now we are missing a proper interface for this and didn't wanted to rush it.

```
1504  ⟨*package⟩
```

Here we define a macro that extends the `\@uclclist` if needed and afterwards turns itself in a noop.

```

1505 \def\update@uclc@with@cyrillic{%
1506 \expandafter\def\expandafter@\uclclist\expandafter
1507 {\@uclclist
1508 \cyra\CYRA\cyrabhch\CYRABHCH\cyrabhchdsc\CYRABHCHDSC\cyrabhdze
1509 \CYRABHDZE\cyrabhha\CYRABHHA\cyrae\CYRAE\cyrb\CYRB\cyrbysus
1510 \CYRBYUS\cyrc\CYRC\cyrch\CYRCH\cyrchldsc\CYRCHLDSC\cyrchrdsc
1511 \CYRCHRDSC\cyrchvcrs\CYRCHVCRS\cyrd\CYRD\cyrdelta\CYRDELTA
1512 \cyrdje\CYRDJE\cyrdze\CYRDZE\cyrdzhe\CYRDZHE\cyre\CYRE\cyreps
1513 \CYREPS\cyrjev\CYREREV\cyrery\CYRERY\cyrf\CYRF\cyrita
1514 \CYRFITA\cyrg\CYRG\cyrgdsc\CYRGDSC\cyrgdshcrs\CYRGDSCHCRS
1515 \cyrgchrs\CYRGHCRS\cyrgkh\CYRGHK\cyrgup\CYRGUP\cyrh\CYRH
1516 \cyrhdsc\CYRHDSC\cyrhhrs\CYRHHCRS\cyrhkh\CYRHHK\cyrhrrdsn
1517 \CYRHRDSN\cyri\CYRI\cyrie\CYRIE\cyrii\CYRII\cyrishrt\CYRISHRT
1518 \cyrishrtdsc\CYRISHRTDSC\cyrizh\CYRIZH\cyrje\CYRJE\cyrk\CYRK
1519 \cyrkbeak\CYRKBEAK\cyrkds\CYRKDSC\cyrkhrs\CYRKHCRS\cyrkhk
1520 \CYRKHK\cyrkvcrs\CYRKVCRS\cyrl\CYRL\cyrlldsc\CYRLDSC\cyrlhk
1521 \CYRLHK\cyrlje\CYRLJE\cyr\CYRM\cyrmdsc\CYRMDSC\cyrmhk\CYRMHK
1522 \cyrn\CYRN\cyrndsc\CYRNDSC\cyrng\CYRNG\cyrnhk\CYRNHK\cyrnje
1523 \CYRNJE\cyrnlhk\CYRNLHK\cyro\CYRO\cyrotld\CYROTLD\cyrp\CYRP
1524 \cyrphk\CYRPHK\cyrq\CYRQ\cyrr\CYRR\cyrrdsc\CYRRDSC\cyr rhk
1525 \CYRRHK\cyrrtick\CYRRTICK\cyr\CYRS\cyrscrs\CYRSACRS
1526 \cyrschwa\CYRSCHWA\cyrsdsc\CYRSDSC\cyrsemisftsn\CYRSEMISFTSN

```

```

1527 \cyrstsn\CYRSFTSN\cyrsh\CYRSH\cyrshch\CYRSHCH\cyrshha\CYRSHHA
1528 \cyr\CYRT\cyrtdsc\CYRTDSC\cyrtdsc\CYRTDSC\cyrtdsc\CYRTDSC\cyrtdsc\CYRTDSC
1529 \cyr\CYRU\cyrushrt\CYRUSHRT\cyr\CYRV\cyrw\CYRW\cyr\CYRY\cyr\CYRY
1530 \cyr\CYRYA\cyr\CYRYAT\cyr\CYRYAT\cyr\CYRYAT\cyr\CYRYAT\cyr\CYRYAT\cyr\CYRYAT
1531 \CYRYO\cyr\CYRYO\cyr\CYRYO\cyr\CYRYO\cyr\CYRYO\cyr\CYRYO\cyr\CYRYO\cyr\CYRYO
1532 \cyrzhdsc\CYRZHDSC}%
1533 \let\update@uclc@with@cyrillic\relax
1534 }

```

Here we process each option:

```

1535 \DeclareOption*{%
1536 \let\encodingdefault\CurrentOption

```

From 2020/02/02 release onward we only load the encoding files if they haven't be loaded already. To check this we look if `\T@encoding` is already defined. If not we load (indicated by setting the switch `@tempswa` to true and we always load if we run in an older format (or rather in a rollback situation).

```

1537 \@tempswafalse
1538 \@ifl@t@r\fmtversion{2020/02/02}%
1539 {\expandafter\ifx\csname T@\CurrentOption\endcsname\relax
1540 \@tempswatrue\fi}%
1541 {\@tempswatrue}%

```

Load if necessary:

```

1542 \if@tempswa
1543 \edef\reserved@f{%
1544 \lowercase{\def\noexpand\reserved@f{\CurrentOption enc.def}}}%
1545 \reserved@f
1546 \InputIfFileExists\reserved@f
1547 {\PackageError{fontenc}%
1548 {Encoding file '\reserved@f' not found.%
1549 \MessageBreak
1550 You might have misspelt the name of the encoding}%
1551 {Necessary code for this encoding was not
1552 loaded.\MessageBreak
1553 Thus calling the encoding later on will
1554 produce further error messages.}}%
1555 \let\reserved@f\relax

```

In case the current encoding is one of a list of known cyrillic ones we extend the `\@uclclist`:

```

1556 \expandafter\in@\expandafter{\CurrentOption}%
1557 {T2A,T2B,T2C,X2,LCY,OT2}%
1558 \ifin@

```

But only if it hasn't already been extended. This might happen if there are several calls to fontenc loading one of the above encodings. If we don't do this check the `\@uclclist` gets unnecessarily big, slowing down the processing at runtime.

```

1559 \expandafter\in@\expandafter\cyr\expandafter
1560 {\@uclclist}%
1561 \ifin@
1562 \else
1563 \update@uclc@with@cyrillic
1564 \fi
1565 \fi

```

```

1566 \fi
1567 }
1568 \ProcessOptions*

```

We select the new font encoding default (i.e., the last encoding specified in the option list. But this encoding may not work with the current `\fontshape`, e.g., `LY1` is not defined for `cmr` and therefore packages switching to `LY1` usually also change `\rmdefault`. But that only applies at `\begin{document}` so we get a spurious warning if we use what L<sup>A</sup>T<sub>E</sub>X previously used:

```

1569 %\fontencoding\encodingdefault\selectfont

```

So instead we do this here:

```

1570 \usefont\encodingdefault\familydefault\seriesdefault\shapedefault

```

To save some space we get rid of the macro extending the `\@uclclist` (might have happened already).

```

1571 \let\update@uclc@with@cyrillic\relax

```

Finally we pretend that the `fontenc` package wasn't read in. This allows for using it several times, e.g., in a class file and in the preamble (at the cost of not getting any version info). That kind of hackery shows that using a general purpose package just for loading an encoding is not the right kind of interface for setting up encodings — it will get replaced at some point in the future.

```

1572 \let\@elt\relax
1573 \xdef\@fontenc@load@list{\@fontenc@load@list
1574   \@elt{\csname opt@fontenc.sty\endcsname}}

1575 \global\expandafter\let\csname ver@@fontenc.sty\expandafter\endcsname
1576   \csname ver@fontenc.sty\endcsname
1577 \global\expandafter\let\csname ver@fontenc.sty\endcsname\relax
1578 \global\expandafter\let\csname opt@fontenc.sty\endcsname\relax
1579 \global\let\@ifl@ter@@\@ifl@ter
1580 \def\@ifl@ter#1#2#3#4#5{\global\let\@ifl@ter\@ifl@ter@@}
1581 \endpackage

```

# File t

## ltcounts.dtx

### 1 Counters and Lengths

Commands for defining and using counters. This file defines:

<code>\newcounter</code>	To define a new counter.
<code>\setcounter</code>	To set the value of counters.
<code>\addtocounter</code>	Increase the counter #1 by the number #2.
<code>\stepcounter</code>	Increase a counter by one.
<code>\refstepcounter</code>	Increase a counter by one, also setting the value used by <code>\label</code> .
<code>\value</code>	For accessing the value of the counter as a TeX number (as opposed to <code>\the&lt;counter&gt;</code> which expands to the <i>printed</i> representation of <code>&lt;counter&gt;</code> )
<code>\arabic</code>	<code>\arabic{&lt;counter&gt;}</code> : 1, 2, 3, ...
<code>\roman</code>	<code>\roman{&lt;counter&gt;}</code> : i, ii, iii, ...
<code>\Roman</code>	<code>\Roman{&lt;counter&gt;}</code> : I, II, III, ...
<code>\alph</code>	<code>\alph{&lt;counter&gt;}</code> : a, b, c, ...
<code>\Alph</code>	<code>\Alph{&lt;counter&gt;}</code> : A, B, C, ...
<code>\fnsymbol</code>	<code>\fnsymbol{&lt;counter&gt;}</code> : *, †, ‡, ...
<code>\counterwithin</code>	<code>\counterwithin[&lt;format&gt;]{&lt;counter&gt;}{&lt;within-counter&gt;}</code> : Resets <code>&lt;counter&gt;</code> whenever <code>&lt;within-counter&gt;</code> is stepped. Also redefines <code>\the&lt;counter&gt;</code> command to produce <code>\the&lt;within-counter&gt;.&lt;format&gt;{&lt;counter&gt;}</code> with <code>\arabic</code> as the default for <code>&lt;format&gt;</code> . Star form omits redefining the print representation.
<code>\counterwithout</code>	<code>\counterwithout[&lt;format&gt;]{&lt;counter&gt;}{&lt;within-counter&gt;}</code> : Removes <code>&lt;counter&gt;</code> from the reset list of <code>&lt;within-counter&gt;</code> . Also redefines <code>\the&lt;counter&gt;</code> command to produce <code>&lt;format&gt;{&lt;counter&gt;}</code> with <code>\arabic</code> as the default for <code>&lt;format&gt;</code> . Star form omits redefining the print representation.

1 <\*2ekernel>

#### 1.1 Environment Counter Macros

An environment foo has an associated counter defined by the following control sequences:

<code>\c@foo</code>	Contains the counter's numerical value. It is defined by <code>\newcount\foocounter</code> .
<code>\thefoo</code>	Macro that expands to the printed value of <code>\foocounter</code> . For example, if sections are numbered within chapters, and section headings look like Section II-3. The Nature of Counters then <code>\thesection</code> might be defined by: <code>\def\thesection</code> <code>{\@Roman{\c@chapter}-\@arabic{\c@section}}</code>
<code>\p@foo</code>	Macro that expands to a printed 'reference prefix' of counter foo. Any <code>\ref</code> to a value created by counter foo will produce the expansion of <code>\p@foo\thefoo</code> when the <code>\label</code> command is executed. See file <code>ltxref.dtx</code> for an extension of this mechanism.
<code>\cl@foo</code>	List of counters to be reset when foo stepped. Has format <code>\@elt{countera}\@elt{counterb}\@elt{counterc}</code> .



### NOTE:

`\thefoo` and `\p@foo` *must* be defined in such a way that `\edef\bar{\thefoo}` or `\edef\bar{\p@foo}` defines `\bar` so that it will evaluate to the counter value at the time of the `\edef`, even after `\foocounter` and any other counters have been changed. This will happen if you use the standard commands `\@arabic`, `\@Roman`, etc.

The following commands are used to define and modify counters.

`\refstepcounter{<foo>}`

Same as `\stepcounter`, but it also defines `\@currentreference` so that a subsequent `\label{<bar>}` command causes `\ref{<bar>}` to generate the current value of counter `<foo>`.

`\@definecounter{<foo>}`

Initializes counter `{<foo>}` (with empty reset list), defines `\p@foo` and `\thefoo` to be null. Also adds `<foo>` to `\cl@ckpt` – the reset list of a dummy counter `@ckpt` used for taking checkpoints for the `\include` system.

`\@addtoreset{<foo>}{<bar>}` : Adds counter `<foo>` to the list of counters `\cl@bar` to be reset when counter `<bar>` is stepped.

`\@removefromreset{<foo>}{<bar>}` : Removes counter `<foo>` to the list of counters `\cl@bar` to be reset when counter `<bar>` is stepped.

`\setcounter` `\setcounter{<foo>}{<val>}` : Globally sets `\foocounter` equal to `<val>`.

```
2 \def\setcounter#1#2{%
3   \@ifundefined{c@#1}%
4     {\@nocounterr{#1}}%
5     {\global\csname c@#1\endcsname#2\relax}}
```

(End definition for `\setcounter`.)

`\addtocounter` `\addtocounter{<foo>}{<val>}` Globally increments `\foocounter` by `<val>`.

```
6 \def\addtocounter#1#2{%
7   \@ifundefined{c@#1}%
8     {\@nocounterr{#1}}%
9     {\global\advance\csname c@#1\endcsname #2\relax}}
```

(End definition for `\addtocounter`.)

`\newcounter` `\newcounter{<newctr>}[<oldctr>]` Defines `<newctr>` to be a counter, which is reset when counter `<oldctr>` is stepped. If `<newctr>` already defined produces ‘`c@newctr` already defined’ error.

```
10 \def\newcounter#1{%
11   \expandafter\@ifdefinable \csname c@#1\endcsname
12     {\@definecounter{#1}}%
13   \@ifnextchar[{\@newctr{#1}}{-}]}
```

(End definition for `\newcounter`.)

`\value` `\value{<ctr>}` produces the value of counter `<ctr>`, for use with a `\setcounter` or `\addtocounter` command.

```
14 \def\value#1{\csname c@#1\endcsname}
```

(End definition for `\value`.)

`\@newctr`

```
15 \def\@newctr#1[#2]{%
16   \@ifundefined{c@#2}{\@nocounterr{#2}}{\@addtoreset{#1}{#2}}}
```

(End definition for \@newctr.)

`\stepcounter` `\stepcounterfoo` Globally increments counter `\c@F00` and resets all subsidiary counters.

```
17 \def\stepcounter#1{%
18   \addtocounter{#1}\@ne
19   \begingroup
20     \let\@elt\@stpelt
21     \csname cl@#1\endcsname
22   \endgroup}
```

(End definition for `\stepcounter`.)

`\@stpelt` Rather than resetting the “within” counter to zero we set it to  $-1$  and then run `\stepcounter` that moves it to 0 and also initiates resetting the next level down.

```
23 </2ekernel>
24 <latexrelease>\IncludeInRelease{2015/01/01}{\@stpelt}
25 <latexrelease>                                     {Reset nested counters}%
26 <*2ekernel | latexrelease>
27 \def\@stpelt#1{\global\csname c@#1\endcsname \m@ne\stepcounter{#1}}%
28 <latexrelease>\EndIncludeInRelease
29 </2ekernel | latexrelease>
30 <latexrelease>\IncludeInRelease{0000/00/00}{\@stpelt}
31 <latexrelease>                                     {Reset nested counters}%%
32 <latexrelease>\def\@stpelt#1{\global\csname c@#1\endcsname \z@}%
33 <latexrelease>\EndIncludeInRelease
34 <*2ekernel>
```

(End definition for `\@stpelt`.)

`\cl@@ckpt`

```
35 \def\cl@@ckpt{\@elt{page}}
```

(End definition for `\cl@@ckpt`.)

`\@definecounter`

```
36 \def\@definecounter#1{\expandafter\newcount\csname c@#1\endcsname
37   \setcounter{#1}\z@
38   \global\expandafter\let\csname cl@#1\endcsname\@empty
39   \@addtoreset{#1}{@ckpt}%
40   \global\expandafter\let\csname p@#1\endcsname\@empty
41   \expandafter
42   \gdef\csname the#1\expandafter\endcsname\expandafter
43     {\expandafter\@arabic\csname c@#1\endcsname}}
```

(End definition for `\@definecounter`.)

`\@addtoreset`

```
44 \def\@addtoreset#1#2{\expandafter\@cons\csname cl@#2\endcsname {{#1}}}
```

(End definition for `\@addtoreset`.)

```
45 </2ekernel>
```

`\@removefromreset`

```

46 <latexrelease>\IncludeInRelease{2018-04-01}
47 <latexrelease>          {\@removefromreset}{Add interfaces}%
48 <*2ekernel | latexrelease>
49 \def\@removefromreset#1#2{%

```

Even through this is internal and the programmer should know what he/she is doing we test here if counter #2 is defined. If not, the execution would run into a tight loop.

```

50   \ifundefined{c@#2}\relax
51   {\begingroup
52     \expandafter\let\csname c@#1\endcsname\@removefromreset
53     \def\@elt##1{%
54       \expandafter\ifx\csname c@##1\endcsname\@removefromreset
55       \else
56         \noexpand\@elt{##1}%
57       \fi}%
58     \expandafter\xdef\csname cl@#2\endcsname
59     {\csname cl@#2\endcsname}%
60   \endgroup}}

```

*(End definition for \@removefromreset.)*

`\ifbothcounters` Test if arg #1 and #2 are counters and if so execute #3.

```

61 \def\@ifbothcounters#1#2#3{%
62   \ifundefined{c@#1}{\@nocounterr{#1}}%
63   {% else counter is defined
64     \ifundefined{c@#2}{\@nocounterr{#2}}%
65     {% else both counter and within are defined
66       #3}}

```

*(End definition for \@ifbothcounters.)*

```

67 </2ekernel | latexrelease>
68 <latexrelease>\EndIncludeInRelease
69 <latexrelease>\IncludeInRelease{0000-00-00}
70 <latexrelease>          {\@removefromreset}{Add interfaces}%
71 <latexrelease>\let \@removefromreset \undefined
72 <latexrelease>\let \@ifbothcounters \undefined
73 <latexrelease>\EndIncludeInRelease
74 <*2ekernel>

```

`\counterwithout` New implementation using xparse and supporting an optional format argument.

`\counterwithin`

```

75 </2ekernel>
76 <*2ekernel | latexrelease>
77 <latexrelease>\IncludeInRelease{2021/11/15}%
78 <latexrelease>          {\counterwithout}{counter without/within}%
79 \NewDocumentCommand \counterwithout {s0{\arabic}mm}{%
80   \@ifbothcounters{#3}{#4}{%
81     \@removefromreset{#3}{#4}%
82     \IfBooleanF #1%
83       {\expandafter
84         \gdef\csname the#3\endcsname {#2{#3}}}%
85   }%
86 }

```

```

87 \NewDocumentCommand \counterwithin {s0{\arabic}mm}{%
88   \ifbothcounters{#3}{#4}{%
89     \@addtoreset{#3}{#4}%
90     \IfBooleanF #1%
91       {\expandafter
92         \gdef\csname the#3\expandafter\endcsname
93         \expandafter
94           {\csname the#4\endcsname .#2{#3}}}%
95   }%
96 }

97 </2ekernel | latexrelease>
98 <latexrelease>\EndIncludeInRelease
99 <latexrelease>\IncludeInRelease{2018-04-01}
100 <latexrelease>           {\counterwithout}{counter without/within}%
101 <latexrelease>
102 <latexrelease>\def\counterwithout {\@ifstar\counterwithout@s\counterwithout@x}
103 <latexrelease>\def\counterwithout@s#1#2{%
104 <latexrelease>  \ifbothcounters{#1}{#2}{\@removefromreset{#1}{#2}}
105 <latexrelease>\def\counterwithout@x#1#2{%
106 <latexrelease>  \ifbothcounters{#1}{#2}%
107 <latexrelease>    {\@removefromreset{#1}{#2}%
108 <latexrelease>    \expandafter
109 <latexrelease>    \gdef\csname the#1\expandafter\endcsname\expandafter
110 <latexrelease>      {\expandafter
111 <latexrelease>        \@arabic\csname c@#1\endcsname}}
112 <latexrelease>
113 <latexrelease>\def\counterwithin{\@ifstar\counterwithin@s\counterwithin@x}
114 <latexrelease>\def\counterwithin@s#1#2{%
115 <latexrelease>  \ifbothcounters{#1}{#2}{\@addtoreset{#1}{#2}}

116 <latexrelease>\def\counterwithin@x#1#2{%
117 <latexrelease>  \ifbothcounters{#1}{#2}%
118 <latexrelease>    {\@addtoreset{#1}{#2}%
119 <latexrelease>    \expandafter
120 <latexrelease>    \gdef\csname the#1\expandafter\endcsname\expandafter
121 <latexrelease>      {\csname the#2\expandafter\endcsname\expandafter
122 <latexrelease>        .\expandafter
123 <latexrelease>        \@arabic\csname c@#1\endcsname}}
124 <latexrelease>
125 <latexrelease>\EndIncludeInRelease
126 <latexrelease>\IncludeInRelease{0000-00-00}
127 <latexrelease>           {\counterwithout}{counter without/within}%
128 <latexrelease>\let \counterwithout \undefined
129 <latexrelease>\let \counterwithout@s \undefined
130 <latexrelease>\let \counterwithout@x \undefined
131 <latexrelease>\let \counterwithin \undefined
132 <latexrelease>\let \counterwithin@s \undefined
133 <latexrelease>\let \counterwithin@x \undefined
134 <latexrelease>\EndIncludeInRelease
135 <*2ekernel>

```

(End definition for \counterwithout and \counterwithin.)

Numbering commands for definitions of \theCOUNTER and \list arguments.

All commands can now be used in text and math mode.

`\arabic` Representation of  $\langle counter \rangle$  as arabic numerals. Changed 29 Apr 86 to make it print the obvious thing it COUNTER not positive.

```

136 \def\arabic#1{\expandafter\@arabic\csname c@#1\endcsname}

(End definition for \arabic.)

```

`\roman` Representation of  $\langle counter \rangle$  as lower-case Roman numerals.

```

137 \def\roman#1{\expandafter\@roman\csname c@#1\endcsname}

(End definition for \roman.)

```

`\Roman` Representation of  $\langle counter \rangle$  as upper-case Roman numerals.

```

138 \def\Roman#1{\expandafter\@Roman\csname c@#1\endcsname}

(End definition for \Roman.)

```

`\alph` Representation of  $\langle counter \rangle$  as a lower-case letter: 1 = a, 2 = b, etc.

```

139 \def\alph#1{\expandafter\@alph\csname c@#1\endcsname}

(End definition for \alph.)

```

`\Alph` Representation of  $\langle counter \rangle$  as an upper-case letter: 1 = A, 2 = B, etc.

```

140 \def\Alph#1{\expandafter\@Alph\csname c@#1\endcsname}

(End definition for \Alph.)

```

`\fnsymbol` Representation of  $\langle COUNTER \rangle$  as a footnote symbol: 1 = \*, 2 = †, etc.

```

141 \def\fnsymbol#1{\expandafter\@fnsymbol\csname c@#1\endcsname}

(End definition for \fnsymbol.)

```

`\@arabic` `\@arabic\F00counter` Representation of `\F00counter` as arabic numerals.

```

142 \def\@arabic#1{\number #1} %% changed 29 Apr 86

(End definition for \@arabic.)

```

`\@roman` `\@roman\F00counter` Representation of `\F00counter` as lower-case Roman numerals.

```

143 \def\@roman#1{\romannumeral #1}

(End definition for \@roman.)

```

`\@Roman` `\@Roman\F00counter` Representation of `\F00counter` as upper-case Roman numerals.

```

144 \def\@Roman#1{\expandafter\@slowromancap\romannumeral #1@}

(End definition for \@Roman.)

```

`\@slowromancap` Fully expandable macro to change a roman number to uppercase.

```

145 \def\@slowromancap#1{\ifx @#1% then terminate
146   \else
147     \if i#1I\else\if v#1V\else\if x#1X\else\if l#1L\else\if
148       c#1C\else\if d#1D\else \if m#1M\else#1\fi\fi\fi\fi\fi\fi
149     \expandafter\@slowromancap
150     \fi
151   }

(End definition for \@slowromancap.)

```

`\@alph` `\@alph\F00counter` Representation of `\F00counter` as a lower-case letter: 1 = a, 2 = b, etc.

```

152 \def\@alph#1{%
153   \ifcase#1\or a\or b\or c\or d\or e\or f\or g\or h\or i\or j\or
154     k\or l\or m\or n\or o\or p\or q\or r\or s\or t\or u\or v\or w\or x\or
155     y\or z\else\@ctrerr\fi}

```

(End definition for `\@alph`.)

`\@Alph` `\@Alph\F00counter` Representation of `\F00counter` as an upper-case letter: 1 = A, 2 = B, etc.

```

156 \def\@Alph#1{%
157   \ifcase#1\or A\or B\or C\or D\or E\or F\or G\or H\or I\or J\or
158     K\or L\or M\or N\or O\or P\or Q\or R\or S\or T\or U\or V\or W\or X\or
159     Y\or Z\else\@ctrerr\fi}

```

(End definition for `\@Alph`.)

`\@fnsymbol` Typesetting old fashioned footnote symbols. This can be done both in text or math mode now.

This macro is another example of an ever recurring problem in  $\mathrm{T}_{\mathrm{E}}\mathrm{X}$ : Determining if something is text-mode or math-mode. It is imperative for the decision between text and math to be delayed until the actual typesetting is done as the code in question may go through an `\edef` or `\write` where an `\ifmode` test would be executed prematurely. Hence in the implementation below, `\@fnsymbol` is not robust in itself but the parts doing the actual typesetting are.

In the case of `\@fnsymbol` we make use of the robust command `\TextOrMath` which takes two arguments and typesets the first if in text-mode and the second if in math-mode. Note that in order for this command to make the correct decision, it must insert a `\relax` token if run under regular  $\mathrm{T}_{\mathrm{E}}\mathrm{X}$ , which ruins any kerning between the preceding characters and whatever awaits typesetting. If you use  $\mathrm{eT}_{\mathrm{E}}\mathrm{X}$  as engine for  $\mathrm{L}^{\mathrm{A}}\mathrm{T}_{\mathrm{E}}\mathrm{X}$  (as recommended) this unfortunate side effect is not present.

```

160 </2ekernel>
161 <latexrelease>\IncludeInRelease{2015/01/01}{\@fnsymbol}{Use \TextOrMath}%
162 <*2ekernel | latexrelease>
163 \def\@fnsymbol#1{%
164   \ifcase#1\or \TextOrMath\textasteriskcentered *\or
165     \TextOrMath \textdagger \dagger\or
166     \TextOrMath \textdaggerdbl \ddagger \or
167     \TextOrMath \textsection \mathsection\or
168     \TextOrMath \textparagraph \mathparagraph\or
169     \TextOrMath \textbardbl \|\or
170     \TextOrMath {\textasteriskcentered\textasteriskcentered}{**}\or
171     \TextOrMath {\textdagger\textdagger}{\dagger\dagger}\or
172     \TextOrMath {\textdaggerdbl\textdaggerdbl}{\ddagger\ddagger}\else
173     \@ctrerr \fi
174 }%
175 </2ekernel | latexrelease>
176 <latexrelease>\EndIncludeInRelease
177 <latexrelease>\IncludeInRelease{0000/00/00}{\@fnsymbol}{Use \TextOrMath}%
178 <latexrelease>\def\@fnsymbol#1{\ensuremath{%
179   \ifcase#1\or *\or \dagger\or \ddagger\or \mathsection\or
180   \mathparagraph\or \|\or **\or \dagger\dagger

```

```

181 <latexrelease> \or \ddagger\ddagger \else\@ctrerr\fi}}%
182 <latexrelease>\EndIncludeInRelease
183 <*2ekernel>

```

(End definition for \@fnsymbol.)

**\TextOrMath** When using regular T<sub>E</sub>X, we make this command robust so that it always selects the correct branch in an \ifmmode switch with the usual disadvantage of ruining kerning. For the application we use it for here that shouldn't matter. The alternative would be to mimic \IeC from inputenc but then it will have the disadvantage of choosing the wrong branch if appearing at the beginning of an alignment cell. However, users of eT<sub>E</sub>X will be pleasantly surprised to get the best of both worlds and no bad side effects.

First some code for checking if we are running eT<sub>E</sub>X but making sure not to permanently turn \protected into \relax.

```

184 </2ekernel>
185 <latexrelease>\IncludeInRelease{2015/01/01}{\TextOrMath}{\TextOrMath}%
186 <*2ekernel | latexrelease>
187 \begingroup\expandafter\expandafter\expandafter\endgroup
188 \expandafter\ifx\csname protected\endcsname\relax

```

In case of ordinary T<sub>E</sub>X we define \TextOrMath as a robust command but make sure it always grabs its arguments. If we didn't do this it might very well gobble spaces in the input stream.

```

189 \DeclareRobustCommand\TextOrMath{%
190   \ifmmode \expandafter\@secondoftwo
191   \else \expandafter\@firstoftwo \fi}
192 \protected@edef\TextOrMath#1#2{\TextOrMath{#1}{#2}}
193 \else

```

For eT<sub>E</sub>X the situation is similar. The robust macro is a hidden one so that we again avoid problems of gobbling spaces in the input.

```

194 \protected\expandafter\def\csname TextOrMath\space\endcsname{%
195   \ifmmode \expandafter\@secondoftwo
196   \else \expandafter\@firstoftwo \fi}
197 \edef\TextOrMath#1#2{%
198   \expandafter\noexpand\csname TextOrMath\space\endcsname
199   {#1}{#2}}
200 \fi
201 </2ekernel | latexrelease>
202 <latexrelease>\EndIncludeInRelease
203 <latexrelease>\IncludeInRelease{0000/00/00}{\TextOrMath}{\TextOrMath}%
204 <latexrelease>\let\TextOrMath\@undefined
205 <latexrelease>\EndIncludeInRelease
206 <*2ekernel>

```

(End definition for \TextOrMath.)

```

207 </2ekernel>

```

# File u

## ltnlength.dtx

### 1 Lengths

```

\newlength Declare #1 to be a new length command.
\setlength Set the length command, #1, to the value #2.
\addtolength Increase the value of the length command, #1, by the value #2.
\settowidth Set the length, #1 to the width of a box containing #2.
\settoheight Set the length, #1 to the height of a box containing #2.
\settodepth Set the length, #1 to the depth of a box containing #2.

1 <*/2ekernel>
2 \message{lengths,}

\newlength

3 \def\newlength#1{\@ifdefinable#1{\newskip#1}}

(End definition for \newlength.)

\setlength

4 </2ekernel>
5 <latexrelease>\IncludeInRelease{2015/01/01}%
6 <latexrelease> \setlength}{Using \setlength with \dimen0}%
7 <*/2ekernel | latexrelease>

8 \def\setlength#1#2{#1 #2\relax}
9 </2ekernel | latexrelease>
10 <latexrelease>\EndIncludeInRelease
11 <latexrelease>\IncludeInRelease{0000/00/00}%
12 <latexrelease> \setlength}{Using \setlength with \dimen0}%
13 <latexrelease>\def\setlength#1#2{#1#2\relax}
14 <latexrelease>\EndIncludeInRelease
15 <*/2ekernel>

(End definition for \setlength.)

\addtolength \relax added 24 Mar 86

16 \def\addtolength#1#2{\advance#1 #2\relax}

(End definition for \addtolength.)

\settoheight The obvious analogs of \settowidth.
\settodepth
17 \def\@settodim#1#2#3{\setbox\@tempboxa\hbox{#{#3}}#2#1\@tempboxa}
\settowidth Clear the memory afterwards (which might be a lot).
\@settodim

18 \setbox\@tempboxa\box\voidb@x}
19 \DeclareRobustCommand\settoheight{\@settodim\ht}
20 \DeclareRobustCommand\settodepth {\@settodim\dp}
21 \DeclareRobustCommand\settowidth {\@settodim\wd}

(End definition for \settoheight and others.)

```



`\@settopoint` This macro takes the contents of the skip register that is supplied as its argument and removes the fractional part to make it a whole number of points. This can be used in class files to avoid values like 345.4666666pt when calculating a dimension.

```
22 \def\@settopoint#1{\divide#1\p@\multiply#1\p@}
23 </2ekernel>
```

*(End definition for \@settopoint.)*

# File v

## ltfssbas.dtx

This file contains the main implementation of the ‘low level’ font selection commands. See other parts of the L<sup>A</sup>T<sub>E</sub>X distribution, or *The L<sup>A</sup>T<sub>E</sub>X Companion* for higher level documentation of the L<sup>A</sup>T<sub>E</sub>X ‘New’ Font Selection Scheme.

**Warning:** The macro documentation is still basically the documentation from the first NFSS release and therefore in some cases probably not completely accurate.

## 1 Preliminary macros

We define a number of macros that will be used later.

`\nomath` `\nomath` is used by most macros that will have no effect in math mode. It issues a warning message.

```

1 <*2kernel>
2 \def\nomath#1{\relax\ifmmode
3   \@fontwarning{Command \noexpand#1invalid in math mode}\fi}

```

(End definition for `\nomath`.)

`\no@alphabet@error` The macro `\no@alphabet@error` is called whenever the user requests a math *alphabet* that is not available in the current *version*. In math mode an error message is produced otherwise the command keeps silent. The argument is the name of the control sequence that identifies the math *alphabet*. The `\relax` at the beginning is necessary to prevent T<sub>E</sub>X from scanning too far in certain situations.

```

4 \gdef\no@alphabet@error#1{\relax \ifmmode
5   \@latexerror{Math\space alphabet\space identifier\space
6     \noexpand#1is\space undefined\space in\space math\space
7     version\space ‘\math@version’}%
8   {Your\space requested\space math\space alphabet\space
9     is\space undefined\space in\space the\space current\space
10    math\space version.^^JCheck\space the\space spelling\space
11    or\space use\space the\space \noexpand\SetMathAlphabet\space
12    command.}
13   \fi}

```

(End definition for `\no@alphabet@error`.)

`\new@mathgroup` We also give a new name to `\newfam` and `\fam` to avoid verbal confusion (see the introduction).<sup>23</sup>

`\mathgroup`

```

14 %\def\new@mathgroup{\alloc@8\mathgroup\chardef\sixt@@n}
15 \let\mathgroup\fam
16 %\let\newfam\new@mathgroup
17 \@onlypreamble\new@mathgroup

```

(End definition for `\new@mathgroup` and `\mathgroup`.)

---

<sup>23</sup>For the same reason it seems advisable to `\let\fam` and `\newfam` equal to `\relax`, but this is commented out to retain compatibility to existing style files.

## 2 Macros for setting up the tables

`\DeclareFontShape` The macro `\DeclareFontShape` takes 6 arguments:

```
18 \def\DeclareFontShape{\begingroup
```

First we restore the catcodes of all characters used in the syntax.

```
19 \nfss@catcodes
```

We use `\expandafter \endgroup` to restore catcode in case something goes wrong with the argument parsing (suggested by Tim Van Zandt)

```
20 \expandafter\endgroup
```

```
21 \DeclareFontShape@}
```

(End definition for `\DeclareFontShape`.)

`\DeclareFontShape@`

```
22 \</2kernel>
```

```
23 \<*2kernel | latexrelease>
```

```
24 \<latexrelease>\IncludeInRelease{2020/02/02}%
```

```
25 \<latexrelease> \<DeclareFontShape@>\{Maybe drop one m\}%
```

```
26 \def\DeclareFontShape@#1#2#3#4#5#6{%
```

```
27 \expandafter\ifx\csname #1+#2\endcsname\relax
```

```
28 \<@latex@error{Font family ‘#1+#2’ unknown}\@eha
```

```
29 \else
```

If the series value is incorrectly specified with an extra “m”, e.g., “mc” instead of just “c”, drop the surplus “m” but keep the “m” if it is by its own. In that case also issue a warning that the declaration needs correction.

For this we compare the given value #3 with one where we may have dropped an “m”. If nothing has changes, fine. Otherwise there was a wrong value which is now corrected in `\reservedb` so we use that and also issue a warning.

```
30 \edef\reserved@a{#3}%
```

```
31 \series@maybe@drop@one@m\reserved@a\reserved@b
```

```
32 \ifx\reserved@a\reserved@b\else
```

```
33 \<@latex@note{Font shape #1/#2/#3/#4 has incorrect series
```

```
34 value ‘#3’.\MessageBreak It should not contain an ‘m’!
```

```
35 Please correct it.\MessageBreak Found\}%
```

```
36 \fi
```

```
37 \expandafter
```

```
38 \xdef\csname#1/#2/\reserved@b/#4\endcsname
```

```
39 {\expandafter\noexpand\csname #5\endcsname}%
```

```
40 %
```

Most of the time #6 is empty so using `\let` to `\@empty` saves on space compared to using `\def`. That’s really one of the old space saving techniques and probably not necessary these days.

```
41 \def\reserved@a{#6}%
```

```
42 \global
```

```
43 \expandafter\let\csname#5\endcsname\expandafter\endcsname
```

```
44 \ifx\reserved@a\@empty
```

```
45 \@empty
```

```
46 \else
```

```
47 \reserved@a
```

```
48 \fi
```

```
49 \fi
```

```
50 }
```

```

51 </2ekernel | latexrelease>
52 <latexrelease>\EndIncludeInRelease
53 <latexrelease>\IncludeInRelease{0000/00/00}%
54 <latexrelease>          {\DeclareFontShape@}{Maybe drop one m}%
55 <latexrelease>
56 <latexrelease>\def\DeclareFontShape@#1#2#3#4#5#6{%
57 <latexrelease>  \expandafter\ifx\csname #1+#2\endcsname\relax
58 <latexrelease>    \@latex@error{Font family ‘#1+#2’ unknown}\@eha
59 <latexrelease>  \else
60 <latexrelease>    \expandafter
61 <latexrelease>      \xdef\csname#1/#2/#3/#4\endcsname{\expandafter\noexpand
62 <latexrelease>                                     \csname #5\endcsname}%
63 <latexrelease>    \def\reserved@a{#6}%
64 <latexrelease>    \global
65 <latexrelease>    \expandafter\let\csname#5\endcsname\expandafter\endcsname
66 <latexrelease>    \ifx\reserved@a\@empty
67 <latexrelease>      \@empty
68 <latexrelease>    \else
69 <latexrelease>      \reserved@a
70 <latexrelease>      \fi
71 <latexrelease>    \fi
72 <latexrelease>  }
73 <latexrelease>\EndIncludeInRelease
74 <*2ekernel>

```

(End definition for \DeclareFontShape@.)

**\DeclareFixedFont** Define a direct font switch that avoids all overhead.

```

75 \def\DeclareFixedFont#1#2#3#4#5#6{%
76   \begingroup
77   \math@fontsfalse
78   \every@math@size{}%
79   \fontsize{#6}\z@
80   \usefont{#2}{#3}{#4}{#5}%
81   \global\expandafter\let\expandafter#1\the\font
82   \endgroup
83 }

```

(End definition for \DeclareFixedFont.)

**\do@subst@correction**

```

84 \def\do@subst@correction{%
85   \xdef\subst@correction{%
86     \font@name
87     \global\expandafter\font
88     \csname \curr@fontshape/\f@size\endcsname
89     \noexpand\fontname\font
90     \relax}%

```

Calling `\subst@correction` after the current group means calling it after we have loaded the substitution font which is done inside a group.

```

91   \aftergroup\subst@correction
92 }

```

(End definition for \do@subst@correction.)

`\DeclareFontFamily`

```
93 \def\DeclareFontFamily#1#2#3{%
```

If we want fast checking for the encoding scheme we can just check for `\T@..` being defined.

```
94 % \@tempswafalse
95 % \def\reserved@b{#1}%
96 % \def\cdp@elt##1##2##3##4{\def\reserved@c{##1}%
97 %     \ifx\reserved@b\reserved@c \@tempswatrue\fi}%
98 % \cdp@list
99 % \if@tempswa
100 % \ifundefined{T@#1}%
101 % {
102 %   \@latex@error{Encoding scheme ‘#1’ unknown}\@eha
103 % }%
104 % }
```

Now we have to define the macro `\(<#1>+<#2>)` to contain `#3`. But since most of the time `#3` will be empty we use `\let` in a tricky way rather than a simple `\def` since this will save internal memory. We store the argument `#3` in a temporary macro `\reserved@a`.

```
105 \def\reserved@a{#3}%
```

We compare `\reserved@a` with `\@empty`. If these two are the same we `\let` the ‘extra’ macro equal to `\@empty` which is not the same as doing a `\let` to `\reserved@a` — the latter would blow one extra memory location rather than reusing the one from `\@empty`.

```
106 \global
107 \expandafter\let\csname #1+#2\expandafter\endcsname
108 \ifx \reserved@a\@empty
109 \@empty
110 \else \reserved@a
111 \fi
112 }%
113 }
```

*(End definition for \DeclareFontFamily.)*

`\cdp@list` We initialize the code page list to be empty.

```
114 \let\cdp@list\@empty
115 \@onlypreamble\cdp@list
```

*(End definition for \cdp@list.)*

`\cdp@elt`

```
116 \let\cdp@elt\relax
117 \@onlypreamble\cdp@elt
```

*(End definition for \cdp@elt.)*

`\DeclareFontEncoding`

```
118 \def\DeclareFontEncoding{%
```

First we start with ignoring all blanks and newlines since every surplus space in the second or third argument will come out in a weird place in the document.

```

119 \begingroup
120 \nfss@catcodes
121 \expandafter\endgroup
122 \DeclareFontEncoding@
123 \@onlypreamble\DeclareFontEncoding

124 \def\DeclareFontEncoding@#1#2#3{%
125 \expandafter
126 \ifx\csname T@#1\endcsname\relax
127 \def\cdp@elt{\noexpand\cdp@elt}%
128 \xdef\cdp@list{\cdp@list\cdp@elt{#1}%
129 {\default@family}{\default@series}%
130 {\default@shape}}%

```

To support encoding dependent commands (like accents) we initialise the command `\encoding-cmd` to be `\@changed@cmd`. (See `ltoutenc.dtx` for details.)

```

131 \expandafter\let\csname#1-cmd\endcsname\@changed@cmd
132 \else
133 \@font@info{Redefining font encoding #1}%
134 \fi

135 \global\@namedef{T@#1}{#2}%
136 \global\@namedef{M@#1}{\default@M#3}%

```

Keep a record of the last encoding being declared:

```

137 \xdef\LastDeclaredEncoding{#1}%
138 }
139 \@onlypreamble\DeclareFontEncoding@

```

(End definition for `\DeclareFontEncoding`.)

`\LastDeclaredEncoding` The last encoding being declared by `\DeclareFontEncoding`.

```

140 \def\LastDeclaredEncoding{}

```

(End definition for `\LastDeclaredEncoding`.)

`\DeclareFontSubstitution`

```

141 \def\DeclareFontSubstitution#1#2#3#4{%
142 \expandafter
143 \ifx\csname T@#1\endcsname\relax
144 \@latex@error{Encoding scheme ‘#1’ unknown}\@eha
145 \else
146 \begingroup

```

We loop through the `\cdp@list` and rebuild it anew in `\toks@` thereby replacing the defaults for the encoding in question with the new defaults. It is important to store the encoding to test against expanded in `\reserved@a` since it might just be `\LastDeclaredEncoding` that is passed as `#1`.

```

147 \edef\reserved@a{#1}%
148 \toks@{}%
149 \def\cdp@elt##1##2##3##4{%
150 \def\reserved@b{##1}%
151 \ifx\reserved@a\reserved@b

```

Here we use the new defaults but we use `##1` (i.e., the encoding name already stored previously) since we know that it is expanded.

```
152      \addto@hook\toks@{\cdp@elt{##1}{#2}{#3}{#4}}%
153      \else
```

If `\reserved@a` and `\reserved@b` differ then we simply copy from the old list to the new.

```
154      \addto@hook\toks@{\cdp@elt{##1}{##2}{##3}{##4}}%
155      \fi}%
156      \cdp@list
157      \xdef\cdp@list{\the\toks@}%
158      \endgroup
159      \global
160      \@namedef{D@#1}{%
161          \def\default@family{#2}%
162          \def\default@series{#3}%
163          \def\default@shape{#4}%
164          }%
165      \fi
166  }
167  \@onlypreamble\DeclareFontSubstitution
```

(End definition for `\DeclareFontSubstitution`.)

`\DeclareFontEncodingDefaults`

```
168 \def\DeclareFontEncodingDefaults#1#2{%
169   \ifx\relax#1\else
170     \ifx\default@T\@empty\else
171       \@font@info{Overwriting encoding scheme text defaults}%
172       \fi
173       \gdef\default@T{#1}%
174     \fi
175     \ifx\relax#2\else
176       \ifx\default@M\@empty\else
177         \@font@info{Overwriting encoding scheme math defaults}%
178         \fi
179         \gdef\default@M{#2}%
180       \fi
181     }
182   \@onlypreamble\DeclareFontEncodingDefaults
```

(End definition for `\DeclareFontEncodingDefaults`.)

`\default@T`

`\default@M`

```
183 \let\default@T\@empty
184 \let\default@M\@empty
```

(End definition for `\default@T` and `\default@M`.)

`\DeclarePreloadSizes`

```
185 \def\DeclarePreloadSizes#1#2#3#4#5{%
186   \@ifundefined{T@#1}%
187   {\@latex@error{Encoding scheme ‘#1’ unknown}\@eha}%
188   {%
```

Don't know at the moment what this group here does!

```
189 \begingroup
```

We define a macro `\reserved@f`<sup>24</sup> that grabs the next *size* and loads the corresponding font. This is done by delimiting `\reserved@f`'s only argument by the token `,` (comma).

```
190 \def\reserved@f##1,{%
```

The end of the list will be detected when there are no more elements, i.e. when `\reserved@f`'s argument is empty. The trick used here is explained in Appendix D of the *T<sub>E</sub>Xbook*: if the argument is empty the `\if` will select the first clause and `\let \reserved@f \relax`. (We use the `>` character here since it cannot appear in font file names.)

```
191 \if>##1>%
192 \let\reserved@f\relax
193 \else
```

Otherwise, we define `\font@name` appropriately and call `\pickup@font` to do the work. Note that the requested `\curr@fontshape` combination must have been defined, or you will get an error. The definition of `\font@name` is carried out globally to be consistent with the rest of the code in this file.

```
194 \xdef\font@name{\csname#1/#2/#3/#4/##1\endcsname}%
195 \pickup@font
```

Now we forget the name of the font just loaded. More precisely, we set the corresponding control sequence to `\relax`. This means that later on, when the font is first used, the macro `\define@newfont` is called again to execute the 'extra' macro for this font.

```
196 \global\expandafter\let\font@name\relax
197 \fi
```

Finally we call `\reserved@f` again to process the next *size*. If `\reserved@f` was `\let` equal to `\relax` this will end the macro.

```
198 \reserved@f}%
```

We finish with reinserting the list of sizes after the `\reserved@f` macro and appending an empty element so that the end of the list is recognized properly.

```
199 \reserved@f#5,,%
200 \endgroup
201 }%
202 }
203 \@onlypreamble\DeclarePreloadSizes
```

(End definition for `\DeclarePreloadSizes`.)

`\ifmath@fonts` We need a switch to decide if we have to switch math fonts. For this purpose we provide `\ifmath@fonts` that can be set to true or false by the `\S@...` macros depending on if math fonts are provided for this size or not. The default is of course to switch all fonts.

```
204 \newif\ifmath@fonts \math@fontstrue
```

(End definition for `\ifmath@fonts`.)

---

<sup>24</sup>We cannot use `\@tempa` since it is needed in `\pickup@font`.



`\DeclareMathSizes` `\DeclareMathSizes` takes the text size, math text size, math script size, and math  
`\DeclareMathSizes*` scriptscript size as arguments and defines the right `\S@...` macro.

```

205 \def\DeclareMathSizes{%
206   \@ifstar{\@DeclareMathSizes\math@fontsfalse}%
207   {\@DeclareMathSizes{}}%
208   \@onlypreamble\DeclareMathSizes
(End definition for \DeclareMathSizes and \DeclareMathSizes*.)

```

`\@DeclareMathSizes` This modification by Michael J. Downes on comp.text.tex on 2002/10/17 allows the user  
to have settings such as

```

\DeclareMathSizes{9.5dd}{9.5dd}{7.4dd}{6.6dd}.
209 \</2kernel>
210 \<latexrelease>\IncludeInRelease{2015/01/01}{\@DeclareMathSizes}%
211 \<latexrelease>          {Arbitrary units in \DeclareMathSizes}%
212 \<*2kernel | latexrelease>
213 \def\@DeclareMathSizes #1#2#3#4#5{%
214   \@defaultunits\dimen@ #2pt\relax\@nnil
215   \if $#3$%
216     \expandafter\let\csname S@\strip@pt\dimen@\endcsname\math@fontsfalse
217   \else
218     \@defaultunits\dimen@ii #3pt\relax\@nnil
219     \@defaultunits\@tempdima #4pt\relax\@nnil
220     \@defaultunits\@tempdimb #5pt\relax\@nnil
221     \toks@{#1}%
222     \expandafter\xdef\csname S@\strip@pt\dimen@\endcsname{%
223       \gdef\noexpand\tf@size{\strip@pt\dimen@ii}%
224       \gdef\noexpand\s@size{\strip@pt\@tempdima}%
225       \gdef\noexpand\ssf@size{\strip@pt\@tempdimb}%
226       \the\toks@
227     }%
228   \fi
229 }%
230 \</2kernel | latexrelease>
231 \<latexrelease>\EndIncludeInRelease
232 \<latexrelease>\IncludeInRelease{0000/00/00}{\@DeclareMathSizes}%
233 \<latexrelease>          {Arbitrary units in \DeclareMathSizes}%
234 \<latexrelease>\def\@DeclareMathSizes#1#2#3#4#5{%
235 \<latexrelease>    \@defaultunits\dimen@#2pt\relax\@nnil
236 \<latexrelease>    \if $#3$%
237 \<latexrelease>      \expandafter \let
238 \<latexrelease>        \csname S@\strip@pt\dimen@\endcsname
239 \<latexrelease>        \math@fontsfalse
240 \<latexrelease>    \else
241 \<latexrelease>      \expandafter \gdef
242 \<latexrelease>        \csname S@\strip@pt\dimen@\endcsname
243 \<latexrelease>          {\gdef\tf@size{#3}\gdef\s@size{#4}%
244 \<latexrelease>                                \gdef\ssf@size{#5}%
245 \<latexrelease>          #1%
246 \<latexrelease>                                }%
247 \<latexrelease>    \fi}%
248 \<latexrelease>\EndIncludeInRelease
249 \<*2kernel>

```

```
250 \@onlypreamble\@DeclareMathSizes
```

(End definition for \@DeclareMathSizes.)

## 3 Selecting a new font

### 3.1 Macros for the user

`\fontencoding` As we said in the introduction a font is described by four parameters. We first define macros to specify the wanted *family*, *series*, or *shape*. These are simply recorded in internal macros `\f@family`, `\f@series`, and `\f@shape`, resp. We use `\edef`'s so that the arguments can also be macros.

```
251 \DeclareRobustCommand\fontencoding[1]{%
252   \expandafter\ifx\csname T@#1\endcsname\relax
253   \latexerror{Encoding scheme ‘#1’ unknown}\@eha
254   \else
255   \edef\f@encoding{#1}%
256   \ifx\cf@encoding\f@encoding
```

If the new encoding is the same as the old encoding we have nothing to do. However, in case we had a sequence of several encoding changes without a `\selectfont` in-between we can save processing by making sure that `\enc@update` is `\relax`.

```
257   \let\enc@update\relax
258   \else
```

If current and new encoding differ we define the macro `\enc@update` to contain all updates necessary at `\selectfont` time.

```
259   \let\enc@update\@enc@update
260   \fi
261   \fi
262 }
```

(End definition for `\fontencoding` and `\f@encoding`.)

`\@enc@update`

```
263 \def\@enc@update{%
```

When `\@enc@update` is executed `\f@encoding` holds the encoding name for the new encoding and `\cf@encoding` the name of the last active encoding.

We start by setting the init command for encoding dependent macros to `\@changed@cmd`.

```
264   \expandafter
265   \let
266   \csname\cf@encoding-cmd\endcsname
267   \@changed@cmd
```

Then we turn the one for the new encoding to `\@current@cmd` (see `ltoutenc.dtx` for further explanations).

```
268   \expandafter
269   \let
270   \csname\f@encoding-cmd\endcsname
271   \@current@cmd
```

We execute the default settings `\default@T`, followed by the one for the new encoding.

```
272   \default@T
273   \csname T@\f@encoding\endcsname
```

Finally we change the default substitution values, disable `\enc@update` and make `\f@encoding` officially the current encoding.

```

274         \csname D@\f@encoding\endcsname
275         \let\enc@update\relax
276         \let\cf@encoding\f@encoding
277     }

```

*(End definition for \@enc@update.)*

`\enc@update` The default action in `\selectfont` is to do nothing.

```

278 \let\enc@update\relax

```

*(End definition for \enc@update.)*

`\fontfamily`

`\f@family`

`\fontseries`

`\f@series`

`\fontshape`

`\f@shape`

```

279 \DeclareRobustCommand\fontfamily[1]{\edef\f@family{#1}}

```

There are now defined later (and differently).

```

280 %\DeclareRobustCommand\fontseries[1]{\edef\f@series{#1}}

```

```

281 %\DeclareRobustCommand\fontshape [1]{\edef\f@shape{#1}}

```

*(End definition for \fontfamily and others.)*

`\usefont` Some handy abbreviation if you want to get some particular font in the current size. If also the size should change one has to issue a `\fontsize` command first.

`\fontencoding` needs to do some setup work so we call that, but instead of calling `\fontfamily`, `\fontseries` and `\fontshape` it earlier versions of this code did, we now set `\f@family`, etc. directly. If we would call `\fontseries` or `\fontshape` as it was done in the past, they would now interact with the existing series and shape which is not desired if we intend to use an explicit font shape!

```

282 </2ekernel>
283 <*2ekernel | latexrelease>
284 <latexrelease>\IncludeInRelease{2021/06/01}%
285 <latexrelease>                {\usefont}{Force font face}%
286 \DeclareRobustCommand\usefont[4]{\fontencoding{#1}%
287     \edef\f@family{#2}%
288     \set@target@series{#3}%
289     \edef\f@shape{#4}%

```

Any earlier `\fontseries`, etc. should be canceled and we should switch unconditionally to the requested font face so we drop any code that may have been stored in `\delayed@f@adjustment`.

```

290     \let\delayed@f@adjustment\@empty
291     \selectfont
292     \ignorespaces}
293 </2ekernel | latexrelease>
294 <latexrelease>\EndIncludeInRelease
295 <latexrelease>\IncludeInRelease{2020/02/02}%
296 <latexrelease>                {\usefont}{Drop m in usefont}%
297 <latexrelease>
298 <latexrelease>\DeclareRobustCommand\usefont[4]{\fontencoding{#1}%
299 <latexrelease>     \edef\f@family{#2}%
300 <latexrelease>     \set@target@series{#3}%
301 <latexrelease>     \edef\f@shape{#4}\selectfont

```

```

302 <latexrelease> \ignorespaces}
303 <latexrelease>
304 <latexrelease>\EndIncludeInRelease
305 <latexrelease>\IncludeInRelease{0000/00/00}%
306 <latexrelease> {\usefont}{Drop m in usefont}%
307 <latexrelease>
308 <latexrelease>\DeclareRobustCommand\usefont[4]{\fontencoding{#1}%
309 <latexrelease> \edef\f@family{#2}%
310 <latexrelease> \edef\f@series{#3}%
311 <latexrelease> \edef\f@shape{#4}\selectfont
312 <latexrelease> \ignorespaces}
313 <latexrelease>
314 <latexrelease>\EndIncludeInRelease
315 <*2ekernel>

```

*(End definition for \usefont.)*

**\linespread** The command `\linespread` changes the current `\baselinestretch` by calling `\set@fontsize`. The values for `\f@size` and `\f@baselineskip` will be left unchanged.

```

316 \DeclareRobustCommand\linespread[1]
317 {\set@fontsize{#1}\f@size\f@baselineskip}

```

*(End definition for \linespread.)*

**\fontsize** We also define a macro that allows to specify a size. In this case, however, we also need the value of `\baselineskip`. As the first argument to `\set@fontsize` we pass the current value of `\baselinestretch`. This will either match the internal value (in which case nothing changes, or it will be an updated value due to a user change of that macro using `\renewcommand`. If we would pass the internal `\f@linespread` such a change would be effectively overwritten by a size change.

```

318 \DeclareRobustCommand\fontsize[2]
319 {\set@fontsize\baselinestretch{#1}{#2}}

```

*(End definition for \fontsize.)*

**\f@linespread** This macro holds the current internal value for `\baselinestretch`.

```

320 \let\f@family\@empty
321 \let\f@series\@empty
322 \let\f@shape\@empty
323 \let\f@size\@empty
324 \let\f@baselineskip\@empty
325 \let\f@linespread\@empty

```

*(End definition for \f@linespread.)*

**\cf@encoding**

```

326 \let\f@encoding\@empty
327 \let\cf@encoding\@empty

```

*(End definition for \cf@encoding.)*

`\@defaultunits` The function `\@defaultunits` when wrapped around a `dimen` or `skip` assignment supplies default units. Usage:

```
\@defaultunits\dimen@=#1pt\relax\@nnil
```

Note: the `\relax` is *important*. Other units can be substituted for the ‘pt’ if desired.

We use `\remove@to@nnil` as an auxiliary macros for `\@defaultunits`. It just has to gobble the supplied default unit ‘pt’ or whatever, if it wasn’t used in the assignment.

```
328 \def\@defaultunits{\afterassignment\remove@to@nnil}
```

(End definition for `\@defaultunits`.)

`\strip@pt` This macro strips the characters `pt` produced by using `\the` on a `dimen` register.

`\rem@pt`

```
329 \begingroup
330   \catcode‘P=12
331   \catcode‘T=12
332   \lowercase{
333     \def\x{\def\rem@pt##1.##2PT{##1\ifnum##2>\z@.##2\fi}}
334   \expandafter\endgroup\x
335 \def\strip@pt{\expandafter\rem@pt\the}
```

(End definition for `\strip@pt` and `\rem@pt`.)

`\mathversion` `\mathversion` takes the *math version* name as argument, defines `\math@version` appropriately and switches to the font selected forcing a call to `\glb@settings` if the *version* is known to the system.

`\math@version`

```
336 \DeclareRobustCommand\mathversion[1]
337   {\@nomath\mathversion
338     \expandafter\ifx\csname mv@#1\endcsname\relax
339     \latex@error{Math version ‘#1’ is not defined}\@eha\else
340     \edef\math@version{#1}%
```

We need to force a math font setup both now and at the point where we return to the previous math version. Forcing a math font setup can simply be done by setting `\glb@currsz` to an invalid value since this will trigger the setup when the formula starts.

```
341   \gdef\glb@currsz{}%
```

When the scope of the current `\mathversion` ends we need to restore the old setup. However this time we need to force it directly at least if we are inside math, otherwise we could wait. Another way to enhance this code here is to do the setting only if the version really has changed after all. This might be interesting in case of `amstext` and `boldsymbol`.

```
342   \aftergroup\glb@settings
343   \fi}
```

(End definition for `\mathversion` and `\math@version`.)

If  $\TeX$  would support a hook just before the end of a formula (opposite of `\everymath` so to speak) the implementation of the algorithm would be much simpler because in that case we would set up the correct math fonts at this point without having to worry about incorrect settings due to nesting. The same would be true if in  $\LaTeX$  the use of `$` (as the primitive  $\TeX$  command) would be impossible and instead only a higher-level interface would be available. Note that this does not mean that a `$` couldn’t be the short-hand

for starting and stopping that higher-level interface, it only means that the direct  $\text{\TeX}$  function must be hidden.

Anyway, since we don't have this and won't have it in  $\text{\LaTeX 2}_{\epsilon}$  we need to implement it in a somewhat slower way.

We test for the current math font setup on entry of a formula, i.e., on the hooks  $\text{\everymath}$  and  $\text{\everydisplay}$ . But since these hooks may contain user data we provide ourselves with an internal version of these hooks which stays frozen.

```

\frozen@everymath New internal names for \everymath and \everydisplay.
\frozen@everydisplay 344 \let\frozen@everymath\everymath
                    345 \let\frozen@everydisplay\everydisplay

                    (End definition for \frozen@everymath and \frozen@everydisplay.)

\everymath Now we provide now user hooks that will be called in the frozen internals.
\everydisplay 346 \newtoks\everymath
              347 \newtoks\everydisplay

              (End definition for \everymath and \everydisplay.)

\frozen@everymath Now we define the behaviour of the frozen hooks: first check the math setup then call
                  the user hook.
              348 \frozen@everymath = {\check@mathfonts
              349                      \the\everymath}

              (End definition for \frozen@everymath.)

\frozen@everydisplay Ditto for the display hook.
              350 \frozen@everydisplay = {\check@mathfonts
              351                      \the\everydisplay}

              (End definition for \frozen@everydisplay.)

\curr@math@size This holds locally the current math size.
              352 \let\curr@math@size\@empty

              (End definition for \curr@math@size.)

```

## 3.2 Macros for loading fonts

```

\pickup@font The macro \pickup@font which is used in \selectfont is very simple: if the font name
              is undefined (i.e. not known yet) it calls \define@newfont to load it.
              353 \def\pickup@font{%
              354     \expandafter \ifx \font@name \relax
              355     \define@newfont
              356     \fi}

              (End definition for \pickup@font.)

```

`\split@name` `\pickup@font` assumes that `\font@name` is set but it is sometimes called when `\f@family`, `\f@series`, `\f@shape`, or `\f@size` may have the wrong settings (see, e.g., the definition of `\getanddefine@fonts`). Therefore we need a macro to extract font *family*, *series*, *shape*, and *size* from the font name. To this end we define `\split@name` which takes the font name as a list of characters of `\catcode` 12 (without the backslash at the beginning) delimited by the special control sequence `\@nil`. This is not very complicated: we first ensure that `/` has the right `\catcode`

```
357 {\catcode'\/=12
```

and define `\split@name` so that it will define our private `\f@encoding`, `\f@family`, `\f@series`, `\f@shape`, and `\f@size` macros.

```
358 \gdef\split@name#1/#2/#3/#4/#5\@nil{\def\f@encoding{#1}%
359                                     \def\f@family{#2}%
360                                     \def\f@series{#3}%
361                                     \def\f@shape{#4}%
362                                     \def\f@size{#5}}}
```

(End definition for `\split@name`.)

`\curr@fontshape` Abbreviation which may get removed again for speed.

```
363 \def\curr@fontshape{\f@encoding/\f@family/\f@series/\f@shape}
```

(End definition for `\curr@fontshape`.)

`\define@newfont` Now we can tackle the problem of defining a new font.

```
364 \def\define@newfont{%
```

We have already mentioned that the token list that `\split@name` will get as argument must not start with a backslash. To reach this goal we will set the `\escapechar` to `-1` so that the `\string` primitive will not generate an escape character. To keep this change local we open a group. We use `\begingroup` for this purpose since `\define@newfont` might be called in math mode, and an empty `\bgroup... \egroup` would add an empty Ord atom to the math list and thus affect the spacing.

Also locally redefine `\typeout` so that ‘No file ...fd’ Warnings become Font Info message just sent to the log file.

```
365 \begingroup
366 \let\typeout\@font@info
367 \escapechar\m@ne
```

Then we extract *encoding scheme*, *family*, *series*, *shape*, and *size* from the font name. Note the four `\expandafter`’s so that `\font@name` is expanded first, then `\string`, and finally `\split@name`.

```
368 \expandafter\expandafter\expandafter
369 \split@name\expandafter\string\font@name\@nil
```

If the `\curr@fontshape` combination is not available, (i.e. undefined) we call the macro `\wrong@fontshape` to take care of this case. Otherwise `\extract@font` will load the external font for us.

```
370 % \expandafter\ifx
371 % \csname\curr@fontshape\endcsname \relax
372 \try@load@fontshape % try always
373 % \fi
374 \expandafter\ifx
375 \csname\curr@fontshape\endcsname \relax
376 \wrong@fontshape\else
```

To allow substitution we call the `curr@fontshape` macro which usually will expand to `\relax` but may hold code for substitution (see `\subst@fontshape` definition).

```
377 %      \csname\curr@fontshape\endcsname
378      \extract@font\fi
```

We are nearly finished and must only restore the `\escapechar` by closing the group.

```
379 \endgroup}

380 \def\try@load@fontshape{%
381   \expandafter
382   \ifx\csname \f@encoding+\f@family\endcsname\relax
383     \@font@info{Trying to load font information for
384               \f@encoding+\f@family}%
```

We predefine this combination to be `\@empty` which means that next time we don't try again unnecessary in case we don't find a `.fd` file. If the file contains a `\DeclareFontFamily` command than this setting will be overwritten.

```
385   \global\expandafter\let
386   \csname \f@encoding+\f@family\endcsname\@empty
```

Set the catcodes used in the syntax, but do it only once (this will be restored at the end of the font loading group).

```
387   \nfss@catcodes
388   \let\nfss@catcodes\relax
```

For increased portability make the external filename monospace, but look for the (old style) mixed case filename if the first attempt fails.

On any monospace system this means that the file is looked for twice which takes up time and string space, but at least for this release Check for both names to give people time to re-install their private `fd` files with lowercase names.

```
389   \edef\reserved@a{%
390     \lowercase{%
391       \noexpand\InputIfFileExists{\f@encoding\f@family.fd}}}%
392   \reserved@a\relax
393     {\@input@\f@encoding\f@family.fd}}%
394 \fi}
```

(End definition for `\define@newfont`.)

`\nfss@catcodes` This macro should contain the standard `\catcode` assignments to all characters which are used in the commands found in an `.fd` file and which might have special `\catcodes` in the middle of a document. If necessary, this list can be extended in a package file using a suitable number of `\expandafter`, i.e.,

```
\expandafter\def\expandafter\nfss@catcodes
\expandafter{\nfss@catcodes <additional settings>}
```

Note, that this macro might get executed several times since it is also called by `\DeclareFontShape`, thus it probably should not be misused as a general purpose hook.

```
395 \def\nfss@catcodes{%
```

We start by making `@` a letter and ignoring all blanks and newlines.

```
396   \makeatletter
397   \catcode'\ 9%
398   \catcode'\^^I9%
399   \catcode'\^^M9%
```



Then we set up `\`, `{`, `}`, `#` and `%` in case an `.fd` file is loaded during a verbatim environment.

```

400      \catcode'\z@
401      \catcode'\{ \one
402      \catcode'\} \tw@
403      \catcode'\#6%
404      \catcode'\^7%
405      \catcode'\%14%

```

Then we make sure that the important syntax parts have the right `\catcode`.

```

406      \@makeother\<%
407      \@makeother\>%
408      \@makeother\*%
409      \@makeother\.%
410      \@makeother\-%
411      \@makeother\/%
412      \@makeother\[%
413      \@makeother\]%
414      \@makeother\'%
415      \@makeother\'%
416      \@makeother\"%
417 }

```

*(End definition for \nfss@catcodes.)*

`\LoadFontDefinitionFile` Load and `.fd` files for some encoding and family (if it exists).

```

418 </2ekernel>
419 <*2ekernel | latexrelease>
420 <latexrelease>\IncludeInRelease{2020/02/02}%
421 <latexrelease>          {\LoadFontDefinitionFile}{Loading .fd files}%
422 \def\LoadFontDefinitionFile#1#2{%
423   \begingroup
424     \edef\f@encoding{#1}%
425     \edef\f@family{#2}%
426     \try@load@fontshape
427   \endgroup
428 }
429 </2ekernel | latexrelease>
430 <latexrelease>\EndIncludeInRelease
431 <latexrelease>\IncludeInRelease{0000/00/00}%
432 <latexrelease>          {\LoadFontDefinitionFile}{Loading .fd files}%
433 <latexrelease>
434 <latexrelease>\let\LoadFontDefinitionFile\@undefined
435 <latexrelease>\EndIncludeInRelease
436 <*2ekernel>

```

*(End definition for \LoadFontDefinitionFile.)*

`\DeclareFontFamilySubstitution` The idea for this macro is stolen from the `substitutefont` package by Günter Milde, with some modifications and a new name.

Its purpose is to provide characters in a special encoding that are not available in the current font family to be taken from a different family that is visually compatible (or not if you choose badly). For example, you can match the GFS Didot Greek characters with T<sub>E</sub>X Gyre Pagella (Palatino) by specifying

```
\DeclareFontFamilySubstitution{LGR}{qpl}{udidot}
```

This way if you ask for the LGR encoding in for the qpl family you get the characters from the udidot family substituted.

We need to ensure that the macro is defined with \nfss@catcodes in force (not quite sure why at the moment to be honest).

```
437 \<2kernel>
438 \<*2kernel | latexrelease>
439 \<latexrelease>\IncludeInRelease{2020/02/02}%
440 \<latexrelease>      {\DeclareFontFamilySubstitution}{Provide family substitution}%
441 \begingroup
442 \nfss@catcodes
443 \gdef\DeclareFontFamilySubstitution#1#2#3{%
```

We only provide a set of silent substitutions. The package also (re)declared the family, but this is incorrect in my eyes and it is better to handle that differently.

Of course the families may still need loading at this point and so we arrange for this. Otherwise we might run into trouble because the necessary \DeclareFontFamily has not been seen.

```
444 \LoadFontDefinitionFile{#1}{#2}%
445 \LoadFontDefinitionFile{#1}{#3}%
446 \DeclareFontShape{#1}{#2}{m}{it}{<->ssub * #3/m/it}{}%
447 \DeclareFontShape{#1}{#2}{m}{n}{<->ssub * #3/m/n}{}%
448 \DeclareFontShape{#1}{#2}{m}{sc}{<->ssub * #3/m/sc}{}%
449 \DeclareFontShape{#1}{#2}{m}{sl}{<->ssub * #3/m/sl}{}%
```

These days a few more shapes might be around, so we declare those too. If they don't exist then after the first substitution normal fallbacks will happen.

```
450 \DeclareFontShape{#1}{#2}{m}{sw}{<->ssub * #3/m/sw}{}%
451 \DeclareFontShape{#1}{#2}{m}{scit}{<->ssub * #3/m/scit}{}%
452 \DeclareFontShape{#1}{#2}{m}{scsl}{<->ssub * #3/m/scsl}{}%
```

Same game with b and bx, for other weights you are on your own:

```
453 \DeclareFontShape{#1}{#2}{b}{it}{<->ssub * #3/b/it}{}%
454 \DeclareFontShape{#1}{#2}{b}{n}{<->ssub * #3/b/n}{}%
455 \DeclareFontShape{#1}{#2}{b}{scit}{<->ssub * #3/b/scit}{}%
456 \DeclareFontShape{#1}{#2}{b}{scsl}{<->ssub * #3/b/scsl}{}%
457 \DeclareFontShape{#1}{#2}{b}{sc}{<->ssub * #3/b/sc}{}%
458 \DeclareFontShape{#1}{#2}{b}{sl}{<->ssub * #3/b/sl}{}%
459 \DeclareFontShape{#1}{#2}{b}{sw}{<->ssub * #3/b/sw}{}%
460 \DeclareFontShape{#1}{#2}{bx}{it}{<->ssub * #3/bx/it}{}%
461 \DeclareFontShape{#1}{#2}{bx}{n}{<->ssub * #3/bx/n}{}%
462 \DeclareFontShape{#1}{#2}{bx}{scit}{<->ssub * #3/bx/scit}{}%
463 \DeclareFontShape{#1}{#2}{bx}{scsl}{<->ssub * #3/bx/scsl}{}%
464 \DeclareFontShape{#1}{#2}{bx}{sc}{<->ssub * #3/bx/sc}{}%
465 \DeclareFontShape{#1}{#2}{bx}{sl}{<->ssub * #3/bx/sl}{}%
466 \DeclareFontShape{#1}{#2}{bx}{sw}{<->ssub * #3/bx/sw}{}%
467 }
468 \endgroup
469 \</2kernel | latexrelease>
470 \<latexrelease>\EndIncludeInRelease
471 \<latexrelease>\IncludeInRelease{0000/00/00}%
472 \<latexrelease>      {\DeclareFontFamilySubstitution}{Provide family substitution}%
473 \<latexrelease>
```

```

474 <latexrelease>\let\DeclareFontFamilySubstitution\@undefined
475 <latexrelease>\EndIncludeInRelease
476 <*2ekernel>

```

(End definition for \DeclareFontFamilySubstitution.)

**\DeclareErrorFont** Declare the last resort shape! We assume that in this fontshape there is a 10pt font but it doesn't really matter. We only loose one macro name if the assumption is false. But at least the font should be there!

```

477 </2ekernel>
478 <*2ekernel | latexrelease>
479 <latexrelease>\IncludeInRelease{2019/10/01}%
480 <latexrelease>{\DeclareErrorFont}{No side effects please}%
481 \def\DeclareErrorFont#1#2#3#4#5{%
482     \xdef\error@fontshape{%
483         \noexpand\expandafter\noexpand\split@name\noexpand\string
484         \expandafter\noexpand\csname#1/#2/#3/#4/#5\endcsname
485         \noexpand\@nil}%

```

Initialize all those internal variables which may or may not have values in the first seconds of NFSS' bootstrapping process. Later on such values will be updated when an encoding is selected, etc.

We definitely don't want to set \f@encoding; we can set all the others since if they are left "blank" any selection would grab "error default values" as well. However, this probably should go also—and now it did.

```

486 %     \gdef\f@encoding{#1}%
487     \gdef\default@family{#2}%
488     \gdef\default@series{#3}%
489     \gdef\default@shape{#4}%
490 }
491 </2ekernel | latexrelease>
492 <latexrelease>\EndIncludeInRelease
493 <latexrelease>\IncludeInRelease{0000/00/00}%
494 <latexrelease>{\DeclareErrorFont}{No side effects please}%
495 <latexrelease>
496 <latexrelease>\def\DeclareErrorFont#1#2#3#4#5{%
497 <latexrelease>    \xdef\error@fontshape{%
498 <latexrelease>        \noexpand\expandafter\noexpand\split@name\noexpand\string
499 <latexrelease>        \expandafter\noexpand\csname#1/#2/#3/#4/#5\endcsname
500 <latexrelease>        \noexpand\@nil}%
501 <latexrelease>    \gdef\default@family{#2}%
502 <latexrelease>    \gdef\default@series{#3}%
503 <latexrelease>    \gdef\default@shape{#4}%
504 <latexrelease>    \global\let\f@family\default@family
505 <latexrelease>    \global\let\f@series\default@series
506 <latexrelease>    \global\let\f@shape\default@shape
507 <latexrelease>    \gdef\f@size{#5}%
508 <latexrelease>    \gdef\f@baselineskip{#5pt}%
509 <latexrelease>}
510 <latexrelease>\EndIncludeInRelease
511 <*2ekernel>

```

**\@onlypreamble\DeclareErrorFont**

(End definition for \DeclareErrorFont.)

`\wrong@fontshape` Before we come to the macro `\extract@font` we have to take care of unknown `\curr@fontshape` combinations. The general strategy is to issue a warning and to try a default *shape*, then a default *series*, and finally a default *family*. If this last one also fails T<sub>E</sub>X will go into an infinite loop. But if the defaults are set incorrectly one deserves nothing else!

```

513 \endkernel
514 \latexrelease\IncludeInRelease{2015/01/01}{\wrong@fontshape}%
515 \latexrelease{Font substitution in preamble}%
516 \endkernel\latexrelease
517 \def\wrong@fontshape{%
518   \csname D@f@encoding\endcsname % install defaults if in math

```

We remember the wanted `\curr@fontshape` combination which we will need in a moment.

```

519   \edef\reserved@a{\csname\curr@fontshape\endcsname}%
520   \ifx\last@fontshape\reserved@a
521     \errmessage{Corrupted NFSS tables}%
522     \error@fontshape
523   \else

```

Then we warn the user about the mess and set the shape to its default.

```

524   \let\f@shape\default@shape

```

If the combination is not known, try the default *series*.

```

525   \expandafter\ifx\csname\curr@fontshape\endcsname\relax
526     \let\f@series\default@series

```

If this is still undefined, try the default *family*. Otherwise give up. We never try to change the encoding scheme!

```

527   \expandafter
528   \ifx\csname\curr@fontshape\endcsname\relax
529     \let\f@family\default@family

```

If we change the font family and we are in the preamble then the corresponding `.fd` file may not been loaded yet. Therefore we try this now. Otherwise equating the requested font shape with the finally selected fontshape below will fail and can result in “NFSS tables corrupted”. After begin document that will not happen as all `.fd` files involved in substitution are loaded at `\begin{document}`.

```

530   \begingroup
531   \try@load@fontshape
532   \endgroup
533   \fi \fi
534 \fi

```

At this point a valid `\curr@fontshape` combination must have been found. We inform the user about this fact.

The `\expandafter\string` here stops T<sub>E</sub>X adding the space that it usually puts after command names in messages. The similar construction with `\@undefined` just produces ‘undefined’, but saves a few tokens.

`\@wrong@font@char` is locally redefined in `\UseTextSymbol` from its normal (empty) definition, to report the symbol generating the font switch.

```

535   \@font@warning{Font shape '\expandafter\string\reserved@a'
536     \expandafter@gobble\string\@undefined\MessageBreak
537     using '\curr@fontshape' instead\@wrong@font@char}%
538   \global\let\last@fontshape\reserved@a

```

We change `\@defaultsubs` to produce a warning at the end of the document. The macro `\@defaultsubs` is initially `\relax` but gets changed here if some default font substitution happens. It is then executed in `\enddocument`.

```

539 \gdef\@defaultsubs{%
540 \font@warning{Some font shapes were not available, defaults
541 substituted.\@gobbletwo}}%

```

If we substitute a `\curr@fontshape` combination by the default one we don't want the warning to be printed out whenever this (unknown) combination is used. Therefore we globally `\let` the macro corresponding to the wanted combination equal to its substitution. This requires the use of four `\expandafter`'s since `\csname...\endcsname` has to be expanded before `\reserved@a` (i.e. the requested combination), and this must happen before the `\let` is executed.

```

542 \global\expandafter\expandafter\expandafter\let
543 \expandafter\reserved@a
544 \csname\curr@fontshape\endcsname

```

Now we can redefine `\font@name` accordingly. This *must* be done globally since it might occur in the group opened by `\define@newfont`. If we would this definition were local the closing `\endgroup` there would restore the old meaning of `\font@name` and then switch to the wrong font at the end of `\selectfont` although the correct font was loaded.

```

545 \xdef\font@name{%
546 \csname\curr@fontshape/\f@size\endcsname}%

```

The last thing this macro does is to call `\pickup@font` again to load the font if it is not defined yet. At this point this code will loop endlessly if the defaults are not well defined.

```

547 \pickup@font}
548 </2ekernel | latexrelease>
549 <latexrelease>\EndIncludeInRelease
550 <latexrelease>\IncludeInRelease{0000/00/00}{\wrong@fontshape}%
551 <latexrelease> \Font substitution in preamble}%
552 <latexrelease>\def\wrong@fontshape{%
553 <latexrelease> \csname D@f@encoding\endcsname
554 <latexrelease> \edef\reserved@a{\csname\curr@fontshape\endcsname}%
555 <latexrelease> \ifx\last@fontshape\reserved@a
556 <latexrelease> \errmessage{Corrupted NFSS tables}%
557 <latexrelease> \error@fontshape
558 <latexrelease> \else
559 <latexrelease> \let\f@shape\default@shape
560 <latexrelease> \expandafter\ifx\csname\curr@fontshape\endcsname\relax
561 <latexrelease> \let\f@series\default@series
562 <latexrelease> \expandafter
563 <latexrelease> \ifx\csname\curr@fontshape\endcsname\relax
564 <latexrelease> \let\f@family\default@family
565 <latexrelease> \fi \fi
566 <latexrelease> \fi
567 <latexrelease> \font@warning{Font shape
568 <latexrelease> '\expandafter\string\reserved@a'
569 <latexrelease> \expandafter\@gobble\string\@undefined
570 <latexrelease> \MessageBreak
571 <latexrelease> using '\curr@fontshape' instead\@wrong@font@char}%
572 <latexrelease> \global\let\last@fontshape\reserved@a
573 <latexrelease> \gdef\@defaultsubs{%
574 <latexrelease> \font@warning{Some font shapes were not available,

```

```

575 <latexrelease> defaults substituted.\@gobbletwo}}%
576 <latexrelease> \global\expandafter\expandafter\expandafter\let
577 <latexrelease> \expandafter\reserved@a
578 <latexrelease> \csname\curr@fontshape\endcsname
579 <latexrelease> \xdef\font@name{%
580 <latexrelease> \csname\curr@fontshape/\f@size\endcsname}%
581 <latexrelease> \pickup@font}
582 <latexrelease>\EndIncludeInRelease
583 <*2ekernel)

```

(End definition for \wrong@fontshape.)

**\@wrong@font@char** Normally empty but redefined in \UseTextSymbol so that the Font shape undefined message can refer to the symbol causing the problem.

```
584 \let\@wrong@font@char\@empty
```

(End definition for \@wrong@font@char.)

**\@@defaultsubs** See above.

```
\@defaultsubs 585 \let\@defaultsubs\relax
```

(End definition for \@@defaultsubs and \@defaultsubs.)

**\strip@prefix** In \extract@font we will need a way to recover the replacement text of a macro. This is done by the primitive \meaning together with the macro \strip@prefix (for the details see appendix D of the T<sub>E</sub>Xbook, p. 382).

```
586 \def\strip@prefix#1>{\}
```

(End definition for \strip@prefix.)

## 4 Assigning math fonts to *versions*

**\install@mathalphabet** This is just another name for \gdef but we can redefine it if necessary later on.

```
587 \let\install@mathalphabet\gdef
```

(End definition for \install@mathalphabet.)

**\math@fonts**

```
588 \let\math@fonts\@empty
```

(End definition for \math@fonts.)

**\select@group** \select@group has four arguments: the new *<math alphabet identifier>* (a control sequence), the *<math group number>*, the extra macro for math mode and the \curr@fontshape definition macro name. We first check if we are in math mode.

```
589 %\def\select@group#1#2#3{\relax\ifmmode
```

We do these things locally using \begingroup instead of \bgroup to avoid the appearance of an empty Ord atom on the math list.

```
590 % \begingroup
```

We set the math fonts for the *family* in question by calling `\getanddefine@fonts` in the correct environment.

```
591 % \escapechar\m@ne
592 % \getanddefine@fonts{\csname c@mv@math@version\endcsname}#3%
```

We globally select the math fonts...

```
593 % \globaldefs\@ne \math@fonts
```

... and close the group to restore `\globaldefs` and `\escapechar`.

```
594 % \endgroup
```

As long as no *size* or *version* change occurs the  $\langle\textit{math alphabet identifier}\rangle$  should simply switch to the installed *math group* instead of calling `\select@group` unnecessarily. So we globally redefine the first argument (the new  $\langle\textit{math alphabet identifier}\rangle$ ) to expand into a `\mathgroup` switch and then select this *alphabet*. Note that this redefinition will be overwritten by the next call to a *version* macro. The original code for the end of `\select@group` was

```
\gdef#1{#3\mathgroup #2}#1\fi}
```

i.e. first redefining the  $\langle\textit{math alphabet identifier}\rangle$  and then calling the new definition to switch to the wanted  $\langle\textit{math group}\rangle$ . Now we define the  $\langle\textit{math alphabet identifier}\rangle$  as a call to the `\use@mathgroup` command.

```
595 % \xdef#1{\noexpand\use@mathgroup\noexpand#2%
596 % {\number\csname c@mv@math@version\endcsname}}%
```

But this is not sufficient, as we learned the hard way. The problem here is that the loading of the fonts that comprise the alphabet identifier `#1`, as well as the necessary math font assignments is deferred until it is used. This is OK so far, but if the fonts are switched within the current formula (which may happen if a sub-formula is a box that contains a math version switch) the font assignments for `#1` are not restored unless `#1` is used again. This is disastrous since TeX sees the wrong fonts at the end of the math formula, when it converts the math list into a horizontal list.

This is taken into account as follows: When a math alphabet identifier is used for the first time in a certain version it modifies the corresponding macro `\mv@<version>` so that it calls `\getanddefine@fonts` directly in future as well. We use the macro `\extract@alph@from@version` to do this. It takes the math alphabet identifier `#1` and the math version macro as arguments.

```
597 % \expandafter\extract@alph@from@version
598 % \csname mv@math@version\expandafter\endcsname
599 % \expandafter{\number\csname c@mv@math@version\endcsname}%
600 % #1%
601 % \stepcounter{mv@math@version}%
```

Finally, it is not possible to simply call the new definition since we have an argument (the third argument of `\use@mathgroup` or more exactly the argument of `\math@egroup` if the `margid` option is in force) which would swallow our closing `\fi`. So we use the `\expandafter` technique to remove the `\fi` before the `\use@mathgroup` is expanded.

```
602 %\expandafter #1\fi}
```

(End definition for `\select@group`.)

`\extract@alph@from@version` We proceed to the definition of the macro `\extract@alph@from@version`. As stated above, it takes a math alphabet identifier and a math version macro (e.g. `\mv@normal`) as its arguments.

```
603 \def\extract@alph@from@version#1#2#3{%
```

To extract and replace the definition of math alphabet identifier `#3` in macro `#1` we have to recall how this definition looks like: Somewhere in the replacement text of `#1` there is the sequence

```
\install@mathalphabet<math alphabet identifier> #3{%
  <Definitions for >#3}
```

Hence, the first thing we do is to extract the tokens preceding this definitions, the definition itself, and the tokens following it. To this end we define one auxiliary macro `\reserved@a`.

```
604 \def\reserved@a##1\install@mathalphabet#3##2##3\@nil{%
```

When `\reserved@a` is expanded, it will have the tokens preceding the definition in question in its first argument (`##1`), the following tokens in its third argument (`##3`), and the replacement text for the math alphabet identifier `#3` in its second argument. (`##2`). This is then recorded for later use in a temporary macro `\reserved@b`.

```
605 \def\reserved@b{##2}%
```

Additionally, we define a macro `\reserved@c` to reconstruct the definitions for the math version in question from the tokens that will remain unchanged (`##1` and `##3`) and the yet to build new definitions for the math alphabet identifier `#3`.

```
606 \def\reserved@c####1{\gdef#1{##1####1##3}}%
```

Then we execute our auxiliary macro.

```
607 \expandafter\reserved@a#1\@nil
```

OK, so now we have to build the new definition for `#3`. To do so, we first extract the interesting parts out of the old one. The old definition looks like:

```
\select@group<math alphabet identifier>
  <math group number><math extra part>
<curr@fontshape definition>
```

So we define a new temporary macro `\reserved@a` that extracts these parts.

```
608 \def\reserved@a\select@group#3##1##2\@nil{%
```

This macro can now directly rebuild the math version definition by calling `\reserved@c`:

```
609 \reserved@c{%
610 \getanddefine@fonts{#2}##2%
611 \install@mathalphabet#3{%
612 \relax\ifmmode \else \non@alpherr#3\fi
613 \use@mathgroup##1{#2}}%
```

In addition it defines the alphabet the way it should be used from now on.

```
614 \gdef#3{\relax\ifmmode \else \non@alpherr#3\fi
615 \use@mathgroup##1{#2}}%
```

Finally, we only have to call this macro `\reserved@a` on the old definitions recorded in `\reserved@b`:

```
616 \expandafter\reserved@a\reserved@b\@nil
617 }
```

(End definition for `\extract@alph@from@version`.)



`\math@bgroup` Here are the default definitions for `\math@bgroup` and `\math@egroup`. We use `\bgroup`  
`\math@egroup` instead of `\begingroup` to avoid ‘leaking out’ of style changes. This has the side effect  
of always producing mathord atoms.

```
618 \let\math@bgroup\bgroup
619 \def\math@egroup#1{#1\egroup}
```

*(End definition for \math@bgroup and \math@egroup.)*

`\calculate@math@sizes` Here is the default definition for `\calculate@math@sizes` a more elaborate interface is  
under testing in `mtscale.sty`.

```
620 \gdef\calculate@math@sizes{%
621   \@font@info{Calculating\space math\space sizes\space for\space
622     size\space <\f@size>}%
623   \dimen@f@size \p@
624   \@tempdimb \defaultscriptratio \dimen@
625   \dimen@ \defaultscriptscriptratio \dimen@
626   \expandafter\xdef\csname S@\f@size\endcsname{%
627     \gdef\noexpand\tf@size{\f@size}%
628     \gdef\noexpand\sf@size{\strip@pt\@tempdimb}%
629     \gdef\noexpand\ssf@size{\strip@pt\dimen@}%
630     \noexpand\math@fontstrue}}
```

*(End definition for \calculate@math@sizes.)*

`\defaultscriptratio` The default ratio for math sizes is:  
`\defaultscriptscriptratio` 1 to `\defaultscriptratio` to `\defaultscriptscriptratio`.  
By default this is 1 to .7 to .5.

```
631 \def\defaultscriptratio{.7}
632 \def\defaultscriptscriptratio{.5}
```

*(End definition for \defaultscriptratio and \defaultscriptscriptratio.)*

`\noaccents@` If we don’t have a definition for `\noaccents@` we provide a dummy.

```
633 \ifx\noaccents@\@undefined
634   \let\noaccents@\@empty
635 \fi
```

*(End definition for \noaccents@.)*

`\showhyphens` The `\showhyphens` command must be redefined since the version in `plain.tex` uses  
`\tenrm`. We have also made some further adjustments for its use in  $\text{\LaTeX}$ .

```
636 \if2ekernel
637   \latexrelease\IncludeInRelease{2017/01/01}{\showhyphens}%
638   \latexrelease{XeTeX support for \showhyphens}%
639 \if*2ekernel\latexrelease
640   \ifx\XeTeXcharclass\@undefined
```

Version for engines other than  $\text{\LaTeX}$ .

```
641 \DeclareRobustCommand\showhyphens[1]{%
642   \setbox0\vbox{%
643     \color@begingroup
644     \everypar{}%
645     \parfillskip\z@skip\hsize\maxdimen
646     \normalfont
647     \pretolerance\m@ne\tolerance\m@ne\hbadness\z@\showboxdepth\z@\ #1%
648     \color@endgroup}}
```

649 \else

XeTeX version. When using system fonts XeTeX reports consecutive runs of characters as a single item in box logging, which means the standard `\showhyphens` does not work. This version typesets the text into a narrow box to force hyphenation and then reconstructs a horizontal list with explicit hyphens to generate the display. Note that the `lmr` OpenType font is forced, this works even if the characters are not in the font as hyphenation is attempted due to the width of the space and hyphen character. It may generate spurious Missing Character warnings in the log, these are however suppressed from the terminal output by ensuring that `\tracingonline` is locally zero.

```
650 \DeclareRobustCommand\showhyphens[1]{%
651   \setbox0\vbox{%
652     \usefont{TU}{lmr}{m}{n}%
653     \hsize 1sp %
654     \hbadness\@M
655     \hfuzz\maxdimen
656     \tracingonline\z@
657     \everypar={}%
658     \leftskip\z@skip
659     \rightskip\z@skip
660     \parfillskip\z@skip
661     \hyphenpenalty=-\@M
662     \pretolerance\m@ne
663     \interlinepenalty\z@
664     \clubpenalty\z@
665     \widowpenalty\z@
666     \brokenpenalty1127 %
667     \setbox\z@\hbox{}%
668     \noindent
669     \hskip\z@skip
670     #1%
671     \par
```

Note here we stop the loop if made no progress, non-removable items may mean that we can not process the whole list (which would be testable as `\lastnodetype=-1`).

```
672   \loop
673   \@tempswafalse
674   \ifnum\lastnodetype=11\unskip\@tempswatrue\fi
675   \ifnum\lastnodetype=12\unkern\@tempswatrue\fi
676   \ifnum\lastnodetype=13 %
677     \count@\lastpenalty
678     \unpenalty\@tempswatrue
679   \fi
680   \ifnum\lastnodetype=\@ne
681     \setbox\tw@\lastbox\@tempswatrue
682     \setbox0\hbox{\unhbox\tw@\unskip\unskip\unpenalty
683       \ifnum\count@=1127 \else\ \fi
684       \unhbox0}%
685     \count@\z@
686   \fi
687   \if@tempswa
688     \repeat
689     \hbadness\z@
690     \hsize\maxdimen
```

```

691 \showboxdepth\z@
692 \tolerance\m@ne
693 \hyphenpenalty\z@
694 \noindent\unhbox\z@
695 }}

696 \fi

697 </2ekernel | latexrelease>
698 <latexrelease>\EndIncludeInRelease
699 <latexrelease>\IncludeInRelease{0000/00/00}{\showhyphens}%
700 <latexrelease> {XeTeX support for \showhyphens}%
701 <latexrelease>\gdef\showhyphens#1{%
702 <latexrelease> \setbox0\vbox{%
703 <latexrelease> \color@begingroup
704 <latexrelease> \everypar{}%
705 <latexrelease> \parfillskip\z@skip\hsize\maxdimen
706 <latexrelease> \normalfont
707 <latexrelease> \pretolerance\m@ne\tolerance\m@ne
708 <latexrelease> \hbadness\z@\showboxdepth\z@\ #1%
709 <latexrelease> \color@endgroup}}
710 <latexrelease>\EndIncludeInRelease
711 <*2ekernel>

```

*(End definition for \showhyphens.)*

**\addto@hook** We need a macro to add tokens to a hook.

```

712 \long\def\addto@hook#1#2{#1\expandafter{\the#1#2}}

```

*(End definition for \addto@hook.)*

**\@vpt**

```

713 \def\@vpt{5}

```

*(End definition for \@vpt.)*

**\@vipt**

```

714 \def\@vipt{6}

```

*(End definition for \@vipt.)*

**\@viipt**

```

715 \def\@viipt{7}

```

*(End definition for \@viipt.)*

**\@viipt**

```

716 \def\@viipt{8}

```

*(End definition for \@viipt.)*

**\@ixpt**

```

717 \def\@ixpt{9}

```

*(End definition for \@ixpt.)*

```

\@xpt
718 \def\@xpt{10}
      (End definition for \@xpt.)

\@xipt
719 \def\@xipt{10.95}
      (End definition for \@xipt.)

\@xiipt
720 \def\@xiipt{12}
      (End definition for \@xiipt.)

\@xivpt
721 \def\@xivpt{14.4}
      (End definition for \@xivpt.)

\@xvipt
722 \def\@xvipt{17.28}
      (End definition for \@xvipt.)

\@xxpt
723 \def\@xxpt{20.74}
      (End definition for \@xxpt.)

\@xxvpt
724 \def\@xxvpt{24.88}
      (End definition for \@xxvpt.)
725 \</2ekernel>

```

# File w

## ltfssaxes.dtx

This file contains the implementation for handling extra axes splitting the series and the values into sub-categories. selection commands. See other parts of the L<sup>A</sup>T<sub>E</sub>X distribution, or *The L<sup>A</sup>T<sub>E</sub>X Companion* for higher level documentation of the L<sup>A</sup>T<sub>E</sub>X Font Selection Scheme.

Everything in the this file got introduced 2020/02/02, so we use large rollback chunks, only interrupted if necessary.

```
1 <*2ekernel | latexrelease>
2 <latexrelease>\IncludeInRelease{2020/02/02}%
3 <latexrelease> {\DeclareFontSeriesChangeRule}{Series change rules}%
```

## 1 Changing the font series

In the original NFSS implementation the series was a single attribute stored in `\f@series` and so one always had to specify both weight and width together. This means it was impossible to typeset, a paragraph in a condensed font and inside have a few words in bold weight (but still condensed) without doing this manually by requesting `\fontseries{bc}\selectfont`.

The new implementation now works differently by looking both at the current value of `\f@series` and the requested new series and out of that combination selects a resulting series value. Thus, if the current series is `c` and we ask for `b` we now get `bc`.

This is done by consulting a simple lookup table. This table is configurable (though most likely that flexibility will seldom of ever be needed) Adding or changing entries in this table are done with `\DeclareFontSeriesChangeRule`.

### 1.1 The series lookup table

`\DeclareFontSeriesChangeRule` The `\DeclareFontSeriesChangeRule` defines entries in a simple database (implemented as a set of commands) that define mappings between from an existing series and requested new series and maps that to a result series (and additionally offers an alternative if the desired one is not existing):

```
#1 current \f@series
#2 requested new series
#3 result (if that exist for the given font family
#4 alternative result (if #3 does not exist)
```

If an `.fd` file has its own substitution rules then `#3` exist and thus `#4` is not applied.

If there is no matching database entry or if neither the result nor the alternate result exist in the font family the requested new series is used (which then may trigger substitutions later on.

```
4 \def\DeclareFontSeriesChangeRule#1#2#3#4{%
5   \@namedef{series@#1@#2}{#{#3}#{#4}}}
```

(End definition for `\DeclareFontSeriesChangeRule`.)

## 1.2 Mapping rules for series changes

The rules set up use explicit series values not `\..default` indirections; my current feeling is that this is in fact better.

With 9 weights and 9 width classes this table is getting a bit large in the end (324 entries) but on the other hand it doesn't change and accessing speed and it is fast this way.

We could alternatively split the axis and maintain weight and width separately, but that would take more processing time and would not allow for setting up explicit exceptions nicely (not sure that this would ever get used though).

Design considerations for mapping entries:

- We make `m` to reset both weight and width (as this is how it always worked). To reset just the width `?m` is provided and to reset just the weight `m?`.
- We do support “*mwidth*” and “*weightm*”, e.g., `mec` to mean “go to medium weight and extra-condensed width”. At the end of the process we automatically drop any leftover `m` in the series name (unless it is just a single `m`).
- If there is no table entry then the target series is used unconditionally. This means that any request to set both weight and width (e.g. `bx` or `ulc`) needs no table entries. For that reason there are no entries which have a weight+width as request (i.e., second argument).

In particular this is also true for cases involving `m`, e.g., `bm` (bold medium width) which automatically gets reduced result in `b` or `mc` (medium weight condensed) which becomes `c` as a result.

- Only a few entries have “alternative” values and perhaps most of them should get dropped. Or maybe not ... needs some thought perhaps.

The idea is that you don't want the normal substitution to kick in because that would reset the shape first and it may be better to stay with `b` when a change to `c` is requested and `bc` doesn't exist, than to go to first change the shape to `n` and then find that `bc/n` doesn't exist either and thus ending up with `m/n`.

- Also: while I did set up all nine standard weight values from `ul` to `ub` I only bothered to provide entries for `ec`, `sc`, `c` and `x`, because other levels of compression/expansion are not in any real fonts that I know.

Could and perhaps should be eventually extended to cover the whole set.

```
6 \DeclareFontSeriesChangeRule {bc}{b}{bc}{}
7 \DeclareFontSeriesChangeRule {bc}{c}{bc}{}
8 \DeclareFontSeriesChangeRule {bc}{eb}{ebc}{}
9 \DeclareFontSeriesChangeRule {bc}{ec}{bec} {bc}
10 \DeclareFontSeriesChangeRule {bc}{el}{elc}{}
11 \DeclareFontSeriesChangeRule {bc}{l}{lc}{}
12 \DeclareFontSeriesChangeRule {bc}{sb}{sbc}{}
13 \DeclareFontSeriesChangeRule {bc}{sc}{bsc} {bc}
14 \DeclareFontSeriesChangeRule {bc}{sl}{slc}{}
15 \DeclareFontSeriesChangeRule {bc}{ub}{ubc}{}
16 \DeclareFontSeriesChangeRule {bc}{ul}{ulc}{}
17 \DeclareFontSeriesChangeRule {bc}{x}{bx}{}

```

```

18 \DeclareFontSeriesChangeRule {bx}{b}{bx}{}
19 \DeclareFontSeriesChangeRule {bx}{c} {bc} {bx} %<-----
20 \DeclareFontSeriesChangeRule {bx}{eb}{ebx}{}
21 \DeclareFontSeriesChangeRule {bx}{ec} {bec} {bx} %<-----
22 \DeclareFontSeriesChangeRule {bx}{el}{elx}{}
23 \DeclareFontSeriesChangeRule {bx}{l}{lx}{}
24 \DeclareFontSeriesChangeRule {bx}{sb} {sbx} {}
25 \DeclareFontSeriesChangeRule {bx}{sc} {bsc} {bx} %<-----
26 \DeclareFontSeriesChangeRule {bx}{sl}{slx} {}
27 \DeclareFontSeriesChangeRule {bx}{ub}{ubx}{}
28 \DeclareFontSeriesChangeRule {bx}{ul}{ulx}{}
29 \DeclareFontSeriesChangeRule {bx}{x}{bx}{}

30 \DeclareFontSeriesChangeRule {b}{bx} {bx} {b} %<-----
31 \DeclareFontSeriesChangeRule {b}{c} {bc} {b} %<-----
32 \DeclareFontSeriesChangeRule {b}{ec} {bec} {b} %<-----
33 \DeclareFontSeriesChangeRule {b}{sb} {sb} {b} %<-----
34 \DeclareFontSeriesChangeRule {b}{sc} {bsc} {b} %<-----
35 \DeclareFontSeriesChangeRule {b}{x} {bx} {b} %<-----

36 \DeclareFontSeriesChangeRule {c}{bx} {bx} {b} %<-----
37 \DeclareFontSeriesChangeRule {c}{b}{bc}{}
38 \DeclareFontSeriesChangeRule {c}{eb}{ebc}{}
39 \DeclareFontSeriesChangeRule {c}{el}{elc}{}
40 \DeclareFontSeriesChangeRule {c}{l}{lc}{}
41 \DeclareFontSeriesChangeRule {c}{sb}{sbc}{}
42 \DeclareFontSeriesChangeRule {c}{sl}{slc}{}
43 \DeclareFontSeriesChangeRule {c}{ub}{ubc}{}
44 \DeclareFontSeriesChangeRule {c}{ul}{ulc}{}
45 \DeclareFontSeriesChangeRule {c}{x}{x}{m} %<-----

46 \DeclareFontSeriesChangeRule {ebc}{b}{bc}{}
47 \DeclareFontSeriesChangeRule {ebc}{c}{ebc}{}
48 \DeclareFontSeriesChangeRule {ebc}{eb}{ebc}{}
49 \DeclareFontSeriesChangeRule {ebc}{ec}{ebec}{ebc}
50 \DeclareFontSeriesChangeRule {ebc}{el}{elc}{}
51 \DeclareFontSeriesChangeRule {ebc}{l}{lc}{}
52 \DeclareFontSeriesChangeRule {ebc}{sb}{sbc}{}
53 \DeclareFontSeriesChangeRule {ebc}{sc}{ebsc}{ebc}
54 \DeclareFontSeriesChangeRule {ebc}{sl}{slc}{}
55 \DeclareFontSeriesChangeRule {ebc}{ub}{ubc}{}
56 \DeclareFontSeriesChangeRule {ebc}{ul}{ulc}{}
57 \DeclareFontSeriesChangeRule {ebc}{x}{ebx}{}

58 \DeclareFontSeriesChangeRule {ec}{bx} {bx} {b} %<-----
59 \DeclareFontSeriesChangeRule {ec}{b}{bec}{}
60 \DeclareFontSeriesChangeRule {ec}{eb}{ebec}{}
61 \DeclareFontSeriesChangeRule {ec}{el}{elec}{}
62 \DeclareFontSeriesChangeRule {ec}{l}{lec}{}
63 \DeclareFontSeriesChangeRule {ec}{sb}{sbec}{}
64 \DeclareFontSeriesChangeRule {ec}{sl}{slec}{}
65 \DeclareFontSeriesChangeRule {ec}{ub}{ubec}{}
66 \DeclareFontSeriesChangeRule {ec}{ul}{ulec}{}
67 \DeclareFontSeriesChangeRule {ec}{x}{x}{m} %<-----

68 \DeclareFontSeriesChangeRule {sc}{bx} {bx} {b} %<-----
69 \DeclareFontSeriesChangeRule {sc}{b}{bsc}{}

```

```

70 \DeclareFontSeriesChangeRule {sc}{eb}{ebsc}{}
71 \DeclareFontSeriesChangeRule {sc}{el}{elsc}{}
72 \DeclareFontSeriesChangeRule {sc}{l}{lsc}{}
73 \DeclareFontSeriesChangeRule {sc}{sb}{sbsc}{}
74 \DeclareFontSeriesChangeRule {sc}{sl}{slsc}{}
75 \DeclareFontSeriesChangeRule {sc}{ub}{ubsc}{}
76 \DeclareFontSeriesChangeRule {sc}{ul}{ulsc}{}
77 \DeclareFontSeriesChangeRule {sc}{x}{x}{m} %<-----

78 \DeclareFontSeriesChangeRule {ebx}{b}{bx}{}
79 \DeclareFontSeriesChangeRule {ebx}{c}{ebc}{}
80 \DeclareFontSeriesChangeRule {ebx}{eb}{ebx}{}
81 \DeclareFontSeriesChangeRule {ebx}{ec}{ebec}{}
82 \DeclareFontSeriesChangeRule {ebx}{el}{elx}{}
83 \DeclareFontSeriesChangeRule {ebx}{l}{lx}{}
84 \DeclareFontSeriesChangeRule {ebx}{sb}{sbx}{}
85 \DeclareFontSeriesChangeRule {ebx}{sc}{ebsc}{}
86 \DeclareFontSeriesChangeRule {ebx}{sl}{slx}{}
87 \DeclareFontSeriesChangeRule {ebx}{ub}{ubx}{}
88 \DeclareFontSeriesChangeRule {ebx}{ul}{ulx}{}
89 \DeclareFontSeriesChangeRule {ebx}{x}{ebx}{}

90 \DeclareFontSeriesChangeRule {eb}{c}{ebc}{}
91 \DeclareFontSeriesChangeRule {eb}{ec}{ebec}{}
92 \DeclareFontSeriesChangeRule {eb}{sc}{ebsc}{}
93 \DeclareFontSeriesChangeRule {eb}{x}{ebx}{}

94 \DeclareFontSeriesChangeRule {elc}{b}{bc}{}
95 \DeclareFontSeriesChangeRule {elc}{c}{elc}{}
96 \DeclareFontSeriesChangeRule {elc}{eb}{ebc}{}
97 \DeclareFontSeriesChangeRule {elc}{ec}{elec}{}
98 \DeclareFontSeriesChangeRule {elc}{el}{elc}{}
99 \DeclareFontSeriesChangeRule {elc}{l}{lc}{}
100 \DeclareFontSeriesChangeRule {elc}{sb}{sbc}{}
101 \DeclareFontSeriesChangeRule {elc}{sc}{elsc}{}
102 \DeclareFontSeriesChangeRule {elc}{sl}{slc}{}
103 \DeclareFontSeriesChangeRule {elc}{ub}{ubc}{}
104 \DeclareFontSeriesChangeRule {elc}{ul}{ulc}{}
105 \DeclareFontSeriesChangeRule {elc}{x}{elx}{}

106 \DeclareFontSeriesChangeRule {elx}{b}{bx}{}
107 \DeclareFontSeriesChangeRule {elx}{c}{elc}{}
108 \DeclareFontSeriesChangeRule {elx}{eb}{ebx}{}
109 \DeclareFontSeriesChangeRule {elx}{ec}{elec}{}
110 \DeclareFontSeriesChangeRule {elx}{el}{elx}{}
111 \DeclareFontSeriesChangeRule {elx}{l}{lx}{}
112 \DeclareFontSeriesChangeRule {elx}{sb}{sbx}{}
113 \DeclareFontSeriesChangeRule {elx}{sc}{elsc}{}
114 \DeclareFontSeriesChangeRule {elx}{sl}{slx}{}
115 \DeclareFontSeriesChangeRule {elx}{ub}{ubx}{}
116 \DeclareFontSeriesChangeRule {elx}{ul}{ulx}{}
117 \DeclareFontSeriesChangeRule {elx}{x}{elx}{}

118 \DeclareFontSeriesChangeRule {el}{c}{elc}{}
119 \DeclareFontSeriesChangeRule {el}{ec}{elec}{}
120 \DeclareFontSeriesChangeRule {el}{sc}{elsc}{}
121 \DeclareFontSeriesChangeRule {el}{x}{elx}{}

```



```

122 \DeclareFontSeriesChangeRule {lc}{b}{bc}{}
123 \DeclareFontSeriesChangeRule {lc}{c}{lc}{}
124 \DeclareFontSeriesChangeRule {lc}{eb}{ebc}{}
125 \DeclareFontSeriesChangeRule {lc}{ec}{lec}{}
126 \DeclareFontSeriesChangeRule {lc}{el}{elc}{}
127 \DeclareFontSeriesChangeRule {lc}{l}{lc}{}
128 \DeclareFontSeriesChangeRule {lc}{sb}{sbc}{}
129 \DeclareFontSeriesChangeRule {lc}{sc}{lsc}{}
130 \DeclareFontSeriesChangeRule {lc}{sl}{slc}{}
131 \DeclareFontSeriesChangeRule {lc}{ub}{ubc}{}
132 \DeclareFontSeriesChangeRule {lc}{ul}{ulc}{}
133 \DeclareFontSeriesChangeRule {lc}{x}{lx}{}

134 \DeclareFontSeriesChangeRule {lx}{b}{bx}{}
135 \DeclareFontSeriesChangeRule {lx}{c}{lc}{}
136 \DeclareFontSeriesChangeRule {lx}{eb}{ebx}{}
137 \DeclareFontSeriesChangeRule {lx}{ec}{lec}{}
138 \DeclareFontSeriesChangeRule {lx}{el}{elx}{}
139 \DeclareFontSeriesChangeRule {lx}{l}{lx}{}
140 \DeclareFontSeriesChangeRule {lx}{sb}{sbx}{}
141 \DeclareFontSeriesChangeRule {lx}{sc}{lsc}{}
142 \DeclareFontSeriesChangeRule {lx}{sl}{slx}{}
143 \DeclareFontSeriesChangeRule {lx}{ub}{ubx}{}
144 \DeclareFontSeriesChangeRule {lx}{ul}{ulx}{}
145 \DeclareFontSeriesChangeRule {lx}{x}{lx}{}

146 \DeclareFontSeriesChangeRule {l}{bx} {bx} {b} %<-----
147 \DeclareFontSeriesChangeRule {l}{b} {b} {bx} %<-----
148 \DeclareFontSeriesChangeRule {l}{c} {lc} {l} % ? %<-----
149 \DeclareFontSeriesChangeRule {l}{ec} {lec} {l} % ? %<-----
150 \DeclareFontSeriesChangeRule {l}{sb} {sb} {b} % ? %<-----
151 \DeclareFontSeriesChangeRule {l}{sc} {lsc} {l} % ? %<-----
152 \DeclareFontSeriesChangeRule {l}{x} {lx} {l} % ? %<-----

153 \DeclareFontSeriesChangeRule {m}{bx} {bx} {b} %<-----
154 \DeclareFontSeriesChangeRule {m}{b} {b} {bx} %<-----
155 \DeclareFontSeriesChangeRule {m}{c} {c} {m} %<-----
156 \DeclareFontSeriesChangeRule {m}{ec} {ec} {m} %<-----
157 \DeclareFontSeriesChangeRule {m}{l} {l} {m} %<-----
158 \DeclareFontSeriesChangeRule {m}{sb} {sb} {b} %<-----
159 \DeclareFontSeriesChangeRule {m}{sc} {sc} {m} %<-----
160 \DeclareFontSeriesChangeRule {m}{x} {x} {m} %<-----

161 \DeclareFontSeriesChangeRule {sbc}{b}{bc}{}
162 \DeclareFontSeriesChangeRule {sbc}{c}{sbc}{}
163 \DeclareFontSeriesChangeRule {sbc}{eb}{ebc}{}
164 \DeclareFontSeriesChangeRule {sbc}{ec}{sbec}{sbc}
165 \DeclareFontSeriesChangeRule {sbc}{el}{elc}{}
166 \DeclareFontSeriesChangeRule {sbc}{l}{lc}{}
167 \DeclareFontSeriesChangeRule {sbc}{sb}{sbc}{}
168 \DeclareFontSeriesChangeRule {sbc}{sc}{sbsc}{sbc}
169 \DeclareFontSeriesChangeRule {sbc}{sl}{slc}{}
170 \DeclareFontSeriesChangeRule {sbc}{ub}{ubc}{}
171 \DeclareFontSeriesChangeRule {sbc}{ul}{ulc}{}
172 \DeclareFontSeriesChangeRule {sbc}{x}{sbx}{}

173 \DeclareFontSeriesChangeRule {sbx}{b}{bx}{}

```

```

174 \DeclareFontSeriesChangeRule {sbx}{c}{sbc}{ }
175 \DeclareFontSeriesChangeRule {sbx}{eb}{ebx}{ }
176 \DeclareFontSeriesChangeRule {sbx}{ec}{sbec}{ }
177 \DeclareFontSeriesChangeRule {sbx}{el}{elx}{ }
178 \DeclareFontSeriesChangeRule {sbx}{l}{lx}{ }
179 \DeclareFontSeriesChangeRule {sbx}{sb}{sbs}{ }
180 \DeclareFontSeriesChangeRule {sbx}{sc}{sbsc}{ }
181 \DeclareFontSeriesChangeRule {sbx}{sl}{slx}{ }
182 \DeclareFontSeriesChangeRule {sbx}{ub}{ubx}{ }
183 \DeclareFontSeriesChangeRule {sbx}{ul}{ulx}{ }
184 \DeclareFontSeriesChangeRule {sbx}{x}{sbx}{ }

185 \DeclareFontSeriesChangeRule {sb}{c} {sbc} {bc} %? %<-----
186 \DeclareFontSeriesChangeRule {sb}{ec} {sbec} {sbc} %? %<-----
187 \DeclareFontSeriesChangeRule {sb}{sc} {sbsc} {sbc} %? %<-----
188 \DeclareFontSeriesChangeRule {sb}{x} {sbx} {bx} %? %<-----

189 \DeclareFontSeriesChangeRule {slc}{b}{bc}{ }
190 \DeclareFontSeriesChangeRule {slc}{c}{slc}{ }
191 \DeclareFontSeriesChangeRule {slc}{eb}{ebc}{ }
192 \DeclareFontSeriesChangeRule {slc}{ec}{slec}{ }
193 \DeclareFontSeriesChangeRule {slc}{el}{elc}{ }
194 \DeclareFontSeriesChangeRule {slc}{l}{lc}{ }
195 \DeclareFontSeriesChangeRule {slc}{sb}{sbc}{ }
196 \DeclareFontSeriesChangeRule {slc}{sc}{slsc}{ }
197 \DeclareFontSeriesChangeRule {slc}{sl}{slc}{ }
198 \DeclareFontSeriesChangeRule {slc}{ub}{ubc}{ }
199 \DeclareFontSeriesChangeRule {slc}{ul}{ulc}{ }
200 \DeclareFontSeriesChangeRule {slc}{x}{slx}{ }

201 \DeclareFontSeriesChangeRule {slx}{b}{bx}{ }
202 \DeclareFontSeriesChangeRule {slx}{c}{slc}{ }
203 \DeclareFontSeriesChangeRule {slx}{eb}{ebx}{ }
204 \DeclareFontSeriesChangeRule {slx}{ec}{slec}{ }
205 \DeclareFontSeriesChangeRule {slx}{el}{elx}{ }
206 \DeclareFontSeriesChangeRule {slx}{l}{lx}{ }
207 \DeclareFontSeriesChangeRule {slx}{sb}{sbs}{ }
208 \DeclareFontSeriesChangeRule {slx}{sc}{slsc}{ }
209 \DeclareFontSeriesChangeRule {slx}{sl}{slx}{ }
210 \DeclareFontSeriesChangeRule {slx}{ub}{ubx}{ }
211 \DeclareFontSeriesChangeRule {slx}{ul}{ulx}{ }
212 \DeclareFontSeriesChangeRule {slx}{x}{slx}{ }

213 \DeclareFontSeriesChangeRule {sl}{c}{slc}{ }
214 \DeclareFontSeriesChangeRule {sl}{ec}{slec}{ }
215 \DeclareFontSeriesChangeRule {sl}{sc}{slsc}{ }
216 \DeclareFontSeriesChangeRule {sl}{x}{slx}{ }

217 \DeclareFontSeriesChangeRule {ubc}{b}{bc}{ }
218 \DeclareFontSeriesChangeRule {ubc}{c}{ubc}{ }
219 \DeclareFontSeriesChangeRule {ubc}{eb}{ebc}{ }
220 \DeclareFontSeriesChangeRule {ubc}{ec}{ubec}{ }
221 \DeclareFontSeriesChangeRule {ubc}{el}{elc}{ }
222 \DeclareFontSeriesChangeRule {ubc}{l}{lc}{ }
223 \DeclareFontSeriesChangeRule {ubc}{sb}{sbc}{ }
224 \DeclareFontSeriesChangeRule {ubc}{sc}{ubsc}{ }
225 \DeclareFontSeriesChangeRule {ubc}{sl}{slc}{ }

```

```

226 \DeclareFontSeriesChangeRule {ubc}{ub}{ubc}{}
227 \DeclareFontSeriesChangeRule {ubc}{ul}{ulc}{}
228 \DeclareFontSeriesChangeRule {ubc}{x}{ubx}{}

229 \DeclareFontSeriesChangeRule {ubx}{b}{bx}{}
230 \DeclareFontSeriesChangeRule {ubx}{c}{ubc}{}
231 \DeclareFontSeriesChangeRule {ubx}{eb}{ebx}{}
232 \DeclareFontSeriesChangeRule {ubx}{ec}{ubec}{}
233 \DeclareFontSeriesChangeRule {ubx}{el}{elx}{}
234 \DeclareFontSeriesChangeRule {ubx}{l}{lx}{}
235 \DeclareFontSeriesChangeRule {ubx}{sb}{sbx}{}
236 \DeclareFontSeriesChangeRule {ubx}{sc}{ubsc}{}
237 \DeclareFontSeriesChangeRule {ubx}{sl}{slx}{}
238 \DeclareFontSeriesChangeRule {ubx}{ub}{ubx}{}
239 \DeclareFontSeriesChangeRule {ubx}{ul}{ulx}{}
240 \DeclareFontSeriesChangeRule {ubx}{x}{ubx}{}

241 \DeclareFontSeriesChangeRule {ub}{c}{ubc}{}
242 \DeclareFontSeriesChangeRule {ub}{ec}{ubec}{}
243 \DeclareFontSeriesChangeRule {ub}{sc}{ubsc}{}
244 \DeclareFontSeriesChangeRule {ub}{x}{ubx}{}

245 \DeclareFontSeriesChangeRule {ulc}{b}{bc}{}
246 \DeclareFontSeriesChangeRule {ulc}{c}{ulc}{}
247 \DeclareFontSeriesChangeRule {ulc}{eb}{ebc}{}
248 \DeclareFontSeriesChangeRule {ulc}{ec}{ulec}{ulc}
249 \DeclareFontSeriesChangeRule {ulc}{el}{elc}{}
250 \DeclareFontSeriesChangeRule {ulc}{l}{lc}{}
251 \DeclareFontSeriesChangeRule {ulc}{sb}{sbc}{}
252 \DeclareFontSeriesChangeRule {ulc}{sc}{ulsc}{ulc}
253 \DeclareFontSeriesChangeRule {ulc}{sl}{slc}{}
254 \DeclareFontSeriesChangeRule {ulc}{ub}{ubc}{}
255 \DeclareFontSeriesChangeRule {ulc}{ul}{ulc}{}
256 \DeclareFontSeriesChangeRule {ulc}{x}{ulx}{}

257 \DeclareFontSeriesChangeRule {ulx}{b}{bx}{}
258 \DeclareFontSeriesChangeRule {ulx}{c}{ulc}{}
259 \DeclareFontSeriesChangeRule {ulx}{eb}{ebx}{}
260 \DeclareFontSeriesChangeRule {ulx}{ec}{ulec}{}
261 \DeclareFontSeriesChangeRule {ulx}{el}{elx}{}
262 \DeclareFontSeriesChangeRule {ulx}{l}{lx}{}
263 \DeclareFontSeriesChangeRule {ulx}{sb}{sbx}{}
264 \DeclareFontSeriesChangeRule {ulx}{sc}{ulsc}{}
265 \DeclareFontSeriesChangeRule {ulx}{sl}{slx}{}
266 \DeclareFontSeriesChangeRule {ulx}{ub}{ubx}{}
267 \DeclareFontSeriesChangeRule {ulx}{ul}{ulx}{}
268 \DeclareFontSeriesChangeRule {ulx}{x}{ulx}{}

269 \DeclareFontSeriesChangeRule {ul}{c}{ulc}{}
270 \DeclareFontSeriesChangeRule {ul}{ec}{ulec}{}
271 \DeclareFontSeriesChangeRule {ul}{sc}{ulsc}{}
272 \DeclareFontSeriesChangeRule {ul}{x}{ulx}{}

273 \DeclareFontSeriesChangeRule {x}{b}{bx}{}
274 \DeclareFontSeriesChangeRule {x}{c}{c}{}
275 \DeclareFontSeriesChangeRule {x}{eb}{ebx}{}
276 \DeclareFontSeriesChangeRule {x}{ec}{ec}{}
277 \DeclareFontSeriesChangeRule {x}{el}{elx}{}

```

```

278 \DeclareFontSeriesChangeRule {x}{l}{lx}{}
279 \DeclareFontSeriesChangeRule {x}{sb}{sbx}{}
280 \DeclareFontSeriesChangeRule {x}{sc}{sc}{}
281 \DeclareFontSeriesChangeRule {x}{sl}{slx}{}
282 \DeclareFontSeriesChangeRule {x}{ub}{ubx}{}
283 \DeclareFontSeriesChangeRule {x}{ul}{ulx}{}

```

Special rules for `lm` etc. aren't needed because if the target `lm` is request it will used if there is no rule and that id then reduced to `l` automatically. Same for `mc` and friends. Only `?m` and `m?` need rules.

So here are the special rules for `m?`:

```

284 \DeclareFontSeriesChangeRule {bc}{m?}{c}{}
285 \DeclareFontSeriesChangeRule {bec}{m?}{ec}{}
286 \DeclareFontSeriesChangeRule {bsc}{m?}{sc}{}
287 \DeclareFontSeriesChangeRule {bx}{m?}{x}{}
288 \DeclareFontSeriesChangeRule {b}{m?}{m}{}
289 \DeclareFontSeriesChangeRule {c}{m?}{c}{}
290 \DeclareFontSeriesChangeRule {ebc}{m?}{c}{}
291 \DeclareFontSeriesChangeRule {ebec}{m?}{ec}{}
292 \DeclareFontSeriesChangeRule {ebsc}{m?}{sc}{}
293 \DeclareFontSeriesChangeRule {ebx}{m?}{x}{}
294 \DeclareFontSeriesChangeRule {eb}{m?}{m}{}
295 \DeclareFontSeriesChangeRule {ec}{m?}{ec}{}
296 \DeclareFontSeriesChangeRule {elc}{m?}{c}{}
297 \DeclareFontSeriesChangeRule {elec}{m?}{ec}{}
298 \DeclareFontSeriesChangeRule {elsc}{m?}{sc}{}
299 \DeclareFontSeriesChangeRule {elx}{m?}{x}{}
300 \DeclareFontSeriesChangeRule {el}{m?}{m}{}
301 \DeclareFontSeriesChangeRule {lc}{m?}{c}{}
302 \DeclareFontSeriesChangeRule {lec}{m?}{ec}{}
303 \DeclareFontSeriesChangeRule {lsc}{m?}{sc}{}
304 \DeclareFontSeriesChangeRule {lx}{m?}{x}{}
305 \DeclareFontSeriesChangeRule {l}{m?}{m}{}
306 \DeclareFontSeriesChangeRule {m}{m?}{m}{}
307 \DeclareFontSeriesChangeRule {sbc}{m?}{c}{}
308 \DeclareFontSeriesChangeRule {sbec}{m?}{ec}{}
309 \DeclareFontSeriesChangeRule {bsc}{m?}{sc}{}
310 \DeclareFontSeriesChangeRule {sbx}{m?}{x}{}
311 \DeclareFontSeriesChangeRule {sb}{m?}{m}{}
312 \DeclareFontSeriesChangeRule {sc}{m?}{sc}{}
313 \DeclareFontSeriesChangeRule {slc}{m?}{c}{}
314 \DeclareFontSeriesChangeRule {slec}{m?}{ec}{}
315 \DeclareFontSeriesChangeRule {slsc}{m?}{sc}{}
316 \DeclareFontSeriesChangeRule {slx}{m?}{x}{}
317 \DeclareFontSeriesChangeRule {sl}{m?}{m}{}
318 \DeclareFontSeriesChangeRule {ubc}{m?}{c}{}
319 \DeclareFontSeriesChangeRule {ubec}{m?}{ec}{}
320 \DeclareFontSeriesChangeRule {ubsc}{m?}{sc}{}
321 \DeclareFontSeriesChangeRule {ubx}{m?}{x}{}
322 \DeclareFontSeriesChangeRule {ub}{m?}{ub}{}
323 \DeclareFontSeriesChangeRule {ulc}{m?}{c}{}
324 \DeclareFontSeriesChangeRule {ulec}{m?}{ec}{}
325 \DeclareFontSeriesChangeRule {ulsc}{m?}{sc}{}
326 \DeclareFontSeriesChangeRule {ulx}{m?}{x}{}

```

```

327 \DeclareFontSeriesChangeRule {ul}{m?}{m}{-}
328 \DeclareFontSeriesChangeRule {x}{m?}{x}{-}
    And there the special rules for ?m:
329 \DeclareFontSeriesChangeRule {bc}{?m}{b}{-}
330 \DeclareFontSeriesChangeRule {bec}{?m}{b}{-}
331 \DeclareFontSeriesChangeRule {bsc}{?m}{b}{-}
332 \DeclareFontSeriesChangeRule {bsc}{?m}{b}{-}
333 \DeclareFontSeriesChangeRule {bx}{?m}{b}{-}
334 \DeclareFontSeriesChangeRule {b}{?m}{b}{-}
335 \DeclareFontSeriesChangeRule {c}{?m}{m}{-}
336 \DeclareFontSeriesChangeRule {ebc}{?m}{eb}{-}
337 \DeclareFontSeriesChangeRule {ebec}{?m}{eb}{-}
338 \DeclareFontSeriesChangeRule {ebsc}{?m}{eb}{-}
339 \DeclareFontSeriesChangeRule {ebsc}{?m}{eb}{-}
340 \DeclareFontSeriesChangeRule {ebx}{?m}{eb}{-}
341 \DeclareFontSeriesChangeRule {eb}{?m}{eb}{-}
342 \DeclareFontSeriesChangeRule {ec}{?m}{m}{-}
343 \DeclareFontSeriesChangeRule {elc}{?m}{el}{-}
344 \DeclareFontSeriesChangeRule {elec}{?m}{el}{-}
345 \DeclareFontSeriesChangeRule {elsc}{?m}{el}{-}
346 \DeclareFontSeriesChangeRule {elsc}{?m}{el}{-}
347 \DeclareFontSeriesChangeRule {elx}{?m}{el}{-}
348 \DeclareFontSeriesChangeRule {el}{?m}{el}{-}
349 \DeclareFontSeriesChangeRule {lc}{?m}{l}{-}
350 \DeclareFontSeriesChangeRule {lec}{?m}{l}{-}
351 \DeclareFontSeriesChangeRule {lsc}{?m}{l}{-}
352 \DeclareFontSeriesChangeRule {lsc}{?m}{l}{-}
353 \DeclareFontSeriesChangeRule {lx}{?m}{l}{-}
354 \DeclareFontSeriesChangeRule {l}{?m}{l}{-}
355 \DeclareFontSeriesChangeRule {m}{?m}{m}{-}
356 \DeclareFontSeriesChangeRule {sbc}{?m}{sb}{-}
357 \DeclareFontSeriesChangeRule {sbec}{?m}{sb}{-}
358 \DeclareFontSeriesChangeRule {bsbc}{?m}{sb}{-}
359 \DeclareFontSeriesChangeRule {bsbc}{?m}{sb}{-}
360 \DeclareFontSeriesChangeRule {sbx}{?m}{sb}{-}
361 \DeclareFontSeriesChangeRule {sb}{?m}{sb}{-}
362 \DeclareFontSeriesChangeRule {sc}{?m}{m}{-}
363 \DeclareFontSeriesChangeRule {sc}{?m}{m}{-}
364 \DeclareFontSeriesChangeRule {slc}{?m}{sl}{-}
365 \DeclareFontSeriesChangeRule {slec}{?m}{sl}{-}
366 \DeclareFontSeriesChangeRule {slsc}{?m}{sl}{-}
367 \DeclareFontSeriesChangeRule {slsc}{?m}{sl}{-}
368 \DeclareFontSeriesChangeRule {slx}{?m}{sl}{-}
369 \DeclareFontSeriesChangeRule {sl}{?m}{sl}{-}
370 \DeclareFontSeriesChangeRule {ubc}{?m}{ub}{-}
371 \DeclareFontSeriesChangeRule {ubec}{?m}{ub}{-}
372 \DeclareFontSeriesChangeRule {ubsc}{?m}{ub}{-}
373 \DeclareFontSeriesChangeRule {ubsc}{?m}{ub}{-}
374 \DeclareFontSeriesChangeRule {ubx}{?m}{ub}{-}
375 \DeclareFontSeriesChangeRule {ub}{?m}{m}{-}
376 \DeclareFontSeriesChangeRule {ulc}{?m}{ul}{-}
377 \DeclareFontSeriesChangeRule {ulec}{?m}{ul}{-}
378 \DeclareFontSeriesChangeRule {ulsc}{?m}{ul}{-}
379 \DeclareFontSeriesChangeRule {ulsc}{?m}{ul}{-}

```

```

380 \DeclareFontSeriesChangeRule {ulx}{?m}{ul}{\}
381 \DeclareFontSeriesChangeRule {ul}{?m}{ul}{\}
382 \DeclareFontSeriesChangeRule {x}{?m}{m}{\}
    Supporting rollback ...
383 </2ekernel | latexrelease>
384 <latexrelease>\EndIncludeInRelease
385 <latexrelease>\IncludeInRelease{0000/00/00}%
386 <latexrelease> {\DeclareFontSeriesChangeRule}{Series change rules}%
387 <latexrelease>
388 <latexrelease>\let\DeclareFontSeriesChangeRule\@undefined
389 <latexrelease>
390 <latexrelease>\EndIncludeInRelease

```

### 1.3 Changing to a new series

```

391 <*2ekernel | latexrelease>
392 <latexrelease>\IncludeInRelease{2021/06/01}%
393 <latexrelease> {\fontseries}{delay fontseries update}%

```

**\fontseries** The **\fontseries** command takes one argument which is the requested new font series. In the original implementation it simply saved the expanded value in **\f@series**. Now we do a bit more processing and look up the final value in the font series data base. This is done by **\merge@font@series**. But the lookup should be done within the target family and call to **\fontseries** might be followed by a **\fontfamily** call. So we delay the processing to **\selectfont** and only record the necessary action in **\delayed@f@adjustment**.

```

394 \DeclareRobustCommand\fontseries[1]{\@forced@seriesfalse
395   \expandafter\def\expandafter\delayed@f@adjustment\expandafter
396     {\delayed@f@adjustment\delayed@merge@font@series{#1}}}

```

*(End definition for \fontseries.)*

**\delayed@f@adjustment** The macro holding the delayed action(s) for use in **\selectfont**.

```

397 \let\delayed@f@adjustment\@empty

```

*(End definition for \delayed@f@adjustment.)*

**\fontseriesforce** To change unconditionally to a new series you can use **\fontseriesforce**. Of course, if the series doesn't exist for the current family substitution still happens, but there is not dependency on the current series.

```

398 \DeclareRobustCommand\fontseriesforce[1]{\@forced@seriestrue
399   \expandafter\def\expandafter\delayed@f@adjustment\expandafter
400     {\delayed@f@adjustment\edef\f@series{#1}}}

```

*(End definition for \fontseriesforce.)*

**\if@forced@series** If the series gets forced we need to know that fact later on.

```

401 \newif\if@forced@series

```

*(End definition for \if@forced@series.)*

```

402 </2ekernel | latexrelease>
403 <latexrelease>\EndIncludeInRelease

```

```

404 <latexrelease>\IncludeInRelease{2020/02/02}%
405 <latexrelease>          {\fontseries}{delay fontseries update}%
406 <latexrelease>
407 <latexrelease>\DeclareRobustCommand\fontseries[1]{\@forced@seriesfalse
408 <latexrelease>          \merge@font@series{#1}}
409 <latexrelease>\DeclareRobustCommand\fontseriesforce[1]{\@forced@seriestrue
410 <latexrelease>          \edef\f@series{#1}}
411 <latexrelease>\let\delayed@f@adjustment\@undefined
412 <latexrelease>

```

For a roll forward we may have to define `\if@forced@series` but this needs doing in a way that  $\mathrm{T}_{\mathrm{E}}\mathrm{X}$  doesn't see it when skipping over conditionals.

```

413 <latexrelease>\expandafter\newif\csname if@forced@series\endcsname
414 <latexrelease>
415 <latexrelease>\EndIncludeInRelease

416 <latexrelease>\IncludeInRelease{0000/00/00}%
417 <latexrelease>          {\fontseries}{delay fontseries update}%
418 <latexrelease>
419 <latexrelease>\DeclareRobustCommand\fontseries[1]{\edef\f@series{#1}}
420 <latexrelease>\let\fontseriesforce\@undefined
421 <latexrelease>
422 <latexrelease>\EndIncludeInRelease

423 <*2ekernel | latexrelease>
424 <latexrelease>\IncludeInRelease{2020/02/02}%
425 <latexrelease>    {\merge@font@series}{Merge series values}%

```

`\merge@font@series` We look up the data base value by expanding the right command twice. If no such value exist then the result will be `\relax` otherwise it will be the two brace groups: the desired result and the alternate result. The first case means that the third argument to `\merge@font@series` will be empty.

```

426 \def\merge@font@series#1{%
427   \expandafter\expandafter\expandafter
428   \merge@font@series@
429   \csname series@\f@series @#1\endcsname
430   {#1}%
431   \@nil
432 }

```

(End definition for `\merge@font@series`.)

`\merge@font@series@` This now defines the new `\f@series`:

```

433 \def\merge@font@series@#1#2#3\@nil{%

```

If the third argument is empty there is no database entry for the combination and the second argument holds the new series so we return that.

Originally the test was simply `\ifx!#3!` but that actually dies if `#3` starts with a conditional and in the definition of `\AmSfont` that is actually the case.

```

434 %\ifcat\expandafter X\detokenize{#1}X%
435 \def\reserved@a{#3}%
436 \ifx\reserved@a\@empty
437   \set@target@series{#2}%
438 \else

```

Otherwise we check if the desired result for the series (#1) exists for the font family and the current shape. All this happens inside `\selectfont` which has already taken care to load the `.fd` file if necessary.

```
439 \edef\reserved@a{\f@encoding /\f@family /#1/\f@shape}%
440 \ifcsname \reserved@a \endcsname
```

If the desired result is available then we use that. However, we do need some post-processing because we need to drop surplus ms due to the way naming convention was designed in the '90s (sigh).

```
441 \set@target@series{#1}%
```

If not, then we try the alternate result (#2).

```
442 \else
443 \ifcsname \f@encoding /\f@family /#2/\f@shape \endcsname
```

If the alternate result exist we use that and also issue a warning (or rather a log entry) that we didn't managed to change to the desired font.

```
444 \set@target@series{#2}%
445 \@font@shape@subst@warning
```

If that doesn't exist either, then we use the requested series unmodified (again with a warning).

```
446 \else
447 \set@target@series{#3}%
448 \@font@shape@subst@warning
449 \fi
450 \fi
451 \fi
452 }
```

It is possible that the previous font and the new one are actually identical (and the font was not found because it still needs loading) in which case a warning would look rather odd. So we make a quick check for that (which is the reason why we defined `\@reserved@a` above instead of doing inline testing inside `\ifcsname`).

```
453 \def\@font@shape@subst@warning{%
454 \edef\reserved@b{\curr@fontshape}%
455 \ifx\reserved@a\reserved@b \else
456 \@font@warning{Font shape '\reserved@a' undefined\MessageBreak
457 using '\reserved@b' instead}%
458 \fi
459 }
```

(End definition for `\merge@font@series@`.)

`\merge@font@series@without@substitution`  
`\merge@font@series@without@substitution@`  
`\delayed@merge@font@series`

`\merge@font@series@without@substitution` works like `\merge@font@series`, i.e., it looks up the combination in the rule base and if there exists an entry it uses it and if not it uses the new series value. However, it doesn't check if there is actually a font face with the new series value as `\merge@font@series` does. This simplified command is used in `\selectfont` at a point where other font attributes are not yet updated so that checking the font face might result incorrect in substitutions.

```
460 \def\merge@font@series@without@substitution#1{%
461 \expandafter\expandafter\expandafter
462 \merge@font@series@without@substitution@
463 \csname series@\f@series @#1\endcsname
```



```

464     {#1}%
465     \@nil
466 }
467 \def\merge@font@series@without@substitution@#1#2#3\@nil{%
468   \def\reserved@a{#3}%
469   \ifx\reserved@a\@empty
470     \set@target@series{#2}%
471   \else
472     \set@target@series{#1}%
473   \fi
474 }

```

(End definition for \merge@font@series@without@substitution,  
\merge@font@series@without@substitution@, and \delayed@merge@font@series.)

**\delayed@merge@font@series** When we delay the merge action in `\fontseries` we first attempt to use merging without substitution. If that results in a non-existing font face the merge is redone in `\selectfont` using a version with substitution. See `\selectfont` for details.

```

475 \let\delayed@merge@font@series\merge@font@series@without@substitution

```

(End definition for \delayed@merge@font@series.)

**\maybe@load@fontshape** A small helper that we use a couple of times: try loading a fontshape (in a group because `\try@load@fontshape` normalizes catcodes and we also want to change `\typeout` so that it doesn't report missing .fd files on the terminal).

```

476 \def\maybe@load@fontshape{%
477   \begingroup
478   \let \typeout \@font@info
479   \try@load@fontshape
480   \endgroup}

```

(End definition for \maybe@load@fontshape.)

**\set@target@series** Finally the code for normalizing the `\f@series` value.

The combined series value determined by the mapping may still contain an `m` that we have to remove (as the .fd files use `c` not `mc` to denote a medium weight condensed series, etc.). We do this in all branches above because a user might have written

```
\DeclareFontSeriesChangeRule {m}{sc}{msc}{mc}
```

instead of using `sc` and `c` as needed in the .fd file.

```

481 \def\set@target@series#1{%

```

We need to `\edef` the argument first in case it starts with a conditional. Then we check (and perhaps drop) an “m” from the value and assign the result to `\f@series`.

```

482   \edef\f@series{#1}%
483   \series@maybe@drop@one@m\f@series\f@series
484 }

```

(End definition for \set@target@series.)

`\series@maybe@drop@one@m` If the series value is in NFSS notation then it should not contain any “m” unless it is just an “m” by its own. So we need to drop surplus “m”s. But we better don’t do this for full names, such as “**semibold**” as used by `autoinst`, for example. So we test against the possible explicit values that should drop an “m”. After that we assign the result to #2 for further use.

```

485 \def\series@maybe@drop@one@m#1{%
486   \expandafter\series@maybe@drop@one@m@x\expandafter{#1}}
487
488 \def\series@maybe@drop@one@m@x#1#2{%

```

The code below is an inline version of the `\in@` macro without the group, so that it works in `\accent`.

```

489   \def\in@@#1,#1,{}%
490   \series@check@toks\expandafter{\in@@
491     ,ulm,elm,lm,slm,mm,sbm,bm,ebm,ubm,muc,mec,mc,msc,msx,mx,mex,mux,{},{},#1,}%
492   \edef\in@@{\the\series@check@toks}%
493   \ifx\in@@\@empty

```

The default definition for `\bfdefault` etc is actually `b\@empty` so that we can detect if the user has changed the default. However that means a) the above test will definitely fail (maybe something to change) and b) we better use `\edef` on the next line to get rid of it as otherwise the test against #2 (e.g. `\bfdef@ult`) will fail in other places.

```

494     \edef#2{#1}%
495   \else
496     \edef#2{\expandafter\series@drop@one@m #1\series@drop@one@m}%
497   \fi
498 }

```

As a precaution we use a private `toks` register not `\toks@` as that is no longer hidden inside the group.

```

499 \newtoks\series@check@toks

```

*(End definition for \series@maybe@drop@one@m.)*

`\series@drop@one@m` Drop up to two ms but keep one if that makes the series value empty. Actually, with the current implementation we know that there is at least one in the series value itself and we added one after it, so all we have to do is now returning #1#2 and dropping the rest.

```

500 \def\series@drop@one@m#1#2#3\series@drop@one@m{%
501 %   \ifx\relax#1#2\relax m\else#1#2\fi
502   #1#2%
503 }

```

*(End definition for \series@drop@one@m.)*

Supporting rollback ...

```

504 </2ekernel | latexrelease>
505 <latexrelease>\EndIncludeInRelease
506 <latexrelease>\IncludeInRelease{0000/00/00}%
507 <latexrelease>   {\merge@font@series}{Merge series values}%
508 <latexrelease>
509 <latexrelease>\let\merge@font@series\@undefined
510 <latexrelease>\let\merge@font@series@\@undefined
511 <latexrelease>\let\@font@shape@subst@warning\@undefined
512 <latexrelease>\let\merge@font@series@without@substitution\@undefined
513 <latexrelease>\let\merge@font@series@without@substitution@\@undefined

```

```

514 <latexrelease>\let\delayed@merge@font@series\@undefined
515 <latexrelease>\let\maybe@load@fontshape\@undefined
516 <latexrelease>\let\set@target@series\@undefined
517 <latexrelease>\let\series@maybe@drop@one@m\@undefined
518 <latexrelease>\let\series@drop@one@m\@undefined
519 <latexrelease>
520 <latexrelease>\EndIncludeInRelease

```

## 2 Changing the shape

Shapes are also split in two axes (though it could be more if that is desirable), essentially building in an “sc” axis).

```

521 <*2ekernel | latexrelease>
522 <latexrelease>\IncludeInRelease{2020/02/02}%
523 <latexrelease> {\DeclareFontShapeChangeRule}{Font shape change rules}%

```

`\DeclareFontShapeChangeRule` The database for shapes is done in exactly the same way, only that it is much smaller and we usually have no alternative shape (or rather it is empty thus not used).

```

524 \def\DeclareFontShapeChangeRule #1#2#3#4{%
525   \namedef{shape@#1@#2}{#{#3}{#4}}

```

(End definition for `\DeclareFontShapeChangeRule`.)

There is kind of the same problem with returning back from `sc` to normal. It sort of needs its own letter. In `fontspec` this was solved by the first time `\upshape` changes `it` or `sl` back (so only `sc` remains) and second time it changes then `sc` back to normal. Maybe that’s not a bad way to handle it, but decided for a slightly different approach: `n` always returns to “normal”, ie resets everything and `up` changes italic or slanted to upright and `ulc` undoes small caps.

So we now offer `\normalshape` (using `\shapedefault` which is normally the same as calling both `\ulcshape` and `\upshape`, only more efficient).

`\ulcshape` To request going back to upper/lowercase we need a new command. It uses `ulc` as shape name but this shape is virtual, i.e., it doesn’t exist as a real shape, it is only used as part of the database table entries and thus only appears in the second argument there (but not in the first).

```

526 \DeclareRobustCommand\ulcshape
527   {\not@math@alphabet\ulcshape\relax
528   \fontshape\ulcdefault\selectfont}
529 \let\ulcdefault\@undefined % for rollback
530 \newcommand\ulcdefault{ulc}

```

(End definition for `\ulcshape`, `\textulc`, and `\ulcdefault`.)

`\swshape` New command to select a swash shape. The standard rules put this in the same category as italics or slanted, i.e., if you ask for it then italics are undone. One could provide more complicated rules so that `it + sw` becomes `swit` but given that there are only very few fonts that have swash letters that level of flexibility (these days) would be just resulting in a lot of combinations that do not exist.

```

531 \DeclareRobustCommand\swshape
532   {\not@math@alphabet\swshape\relax
533   \fontshape\swdefault\selectfont}
534 \let\swdefault\@undefined % for rollback
535 \newcommand\swdefault{sw}

```

(End definition for `\swshape`, `\textsw`, and `\swdefault`.)

`\sscshape` New command to select spaced small capitals. This is only here because `fontaxes` offered it. There isn't a single free font that supports it. However, some commercial ones do, so we offer it so that at some point `fontaxes` could be retired.

So far there aren't any rules for it—probably there should be some putting it in the same category as `sc`.

```
536 \DeclareRobustCommand\sscshape
537     {\not@math@alphabet\sscshape\relax
538     \fontshape\sscdefault\selectfont}
539 \let\sscdefault\undefined      % for rollback
540 \newcommand\sscdefault{ssc}
```

(End definition for `\sscshape`, `\textssc`, and `\sscdefault`.)

## 2.1 Mapping rules for shape combinations

Many of the entries are commented out as we will get that result without any entry.

```
541 %\DeclareFontShapeChangeRule {n}{n}    {n}    {}
542 \DeclareFontShapeChangeRule {n}{it}    {it}    {sl}
543 \DeclareFontShapeChangeRule {n}{sl}    {sl}    {it}
544 %\DeclareFontShapeChangeRule {n}{sw}    {sw}    {}
545 %\DeclareFontShapeChangeRule {n}{sc}    {sc}    {}
546 \DeclareFontShapeChangeRule {n}{ulc}    {n}    {}
547 \DeclareFontShapeChangeRule {n}{up}    {n}    {}

548 %\DeclareFontShapeChangeRule {it}{n}    {n}    {}
549 %\DeclareFontShapeChangeRule {it}{it}    {it}    {}
550 \DeclareFontShapeChangeRule {it}{sl}    {sl}    {it}
551 %\DeclareFontShapeChangeRule {it}{sw}    {sw}    {}
```

If neither `scit` nor `scsl` exist then `sc` will be used as a fallback albeit with a log entry, so except for the latter there will be no change for CM or Latin Modern fonts.

```
552 \DeclareFontShapeChangeRule {it}{sc}    {scit}    {scsl}
553 \DeclareFontShapeChangeRule {it}{ulc}    {it}    {}
554 \DeclareFontShapeChangeRule {it}{up}    {n}    {}

555 %\DeclareFontShapeChangeRule {sl}{n}    {n}    {}
556 \DeclareFontShapeChangeRule {sl}{it}    {it}    {sl}
557 %\DeclareFontShapeChangeRule {sl}{sl}    {sl}    {}
558 %\DeclareFontShapeChangeRule {sl}{sw}    {sw}    {}
559 \DeclareFontShapeChangeRule {sl}{sc}    {scsl}    {scit}
560 \DeclareFontShapeChangeRule {sl}{ulc}    {sl}    {}
561 \DeclareFontShapeChangeRule {sl}{up}    {n}    {}

562 %\DeclareFontShapeChangeRule {sc}{n}    {n}    {}
563 \DeclareFontShapeChangeRule {sc}{it}    {scit}    {scsl}
564 \DeclareFontShapeChangeRule {sc}{sl}    {scsl}    {scit}
565 \DeclareFontShapeChangeRule {sc}{sw}    {scsw}    {sw}
566 %\DeclareFontShapeChangeRule {sc}{sc}    {sc}    {}
567 \DeclareFontShapeChangeRule {sc}{ulc}    {n}    {}
```

The next rule might be a bit surprising and rightly so. Correct would be that `sc` is not affected by `up`, i.e., remains `sc` as showed in the commented out rule. However, for nearly three decades commands such as `sc` or `\textup` changed small caps back to the “normal” shape. So for backward compatibility we keep that behavior.

As a result you are currently typesetting in `scit` or `scsl` using `\upshape` twice will return you to the normal shape too, the first will change to `sc` and the second (because of the rule below) change that to `n`. This is the way `fontspec` implemented its version on this interface, so this rule means we are also compatible with the way `fontspec` behaved. Still it remains an oddity which I would rather liked to have avoided.

```

568 %\DeclareFontShapeChangeRule {sc}{up} {sc} {}
569 \DeclareFontShapeChangeRule {sc}{up} {n} {}

570 %\DeclareFontShapeChangeRule {scit}{n} {n} {}
571 \DeclareFontShapeChangeRule {scit}{it} {scit} {}
572 \DeclareFontShapeChangeRule {scit}{sl} {scsl} {scit}
573 \DeclareFontShapeChangeRule {scit}{sw} {scsw} {sc} % or scit?
574 \DeclareFontShapeChangeRule {scit}{sc} {scit} {}
575 \DeclareFontShapeChangeRule {scit}{ulc} {it} {}
576 \DeclareFontShapeChangeRule {scit}{up} {sc} {}

```

The previous rule assumes that if `scit` exists then it exists as well. If not, the mechanism will save `ulc` in `\f@series` which most certainly doesn't exist. So when a font is later selected that would result in a substitution (so no harm done really). Alternatively, we could in this case use `n` as alternative, which may be a bit faster, but such a setup would be so weird in the first place that this isn't worth the effort.

```

577 %\DeclareFontShapeChangeRule {scsl}{n} {n} {}
578 \DeclareFontShapeChangeRule {scsl}{it} {scit} {scsl}
579 \DeclareFontShapeChangeRule {scsl}{sl} {scsl} {}
580 \DeclareFontShapeChangeRule {scsl}{sw} {scsw} {sc} % or scsl?
581 \DeclareFontShapeChangeRule {scsl}{sc} {scsl} {}
582 \DeclareFontShapeChangeRule {scsl}{ulc} {sl} {}
583 \DeclareFontShapeChangeRule {scsl}{up} {sc} {}

584 %\DeclareFontShapeChangeRule {scsw}{n} {n} {}
585 \DeclareFontShapeChangeRule {scsw}{it} {scit} {scsw}
586 \DeclareFontShapeChangeRule {scsw}{sl} {scsl} {}
587 \DeclareFontShapeChangeRule {scsw}{sw} {scsw} {}
588 \DeclareFontShapeChangeRule {scsw}{sc} {scsw} {}
589 \DeclareFontShapeChangeRule {scsw}{ulc} {sw} {}
590 \DeclareFontShapeChangeRule {scsw}{up} {sc} {}

591 %\DeclareFontShapeChangeRule {sw}{n} {n} {}
592 %\DeclareFontShapeChangeRule {sw}{it} {it} {}
593 %\DeclareFontShapeChangeRule {sw}{sl} {sl} {}
594 %\DeclareFontShapeChangeRule {sw}{sw} {sw} {}
595 \DeclareFontShapeChangeRule {sw}{sc} {scsw} {}
596 \DeclareFontShapeChangeRule {sw}{ulc} {sw} {}
597 \DeclareFontShapeChangeRule {sw}{up} {n} {}

```

Supporting rollback ...

```

598 </2ekernel | latexrelease>
599 <latexrelease>\EndIncludeInRelease
600 <latexrelease>\IncludeInRelease{0000/00/00}%
601 <latexrelease> {\DeclareFontShapeChangeRule}{Font shape change rules}%
602 <latexrelease>
603 <latexrelease>\let\DeclareFontShapeChangeRule\@undefined
604 <latexrelease>\let\ulcshape\@undefined
605 <latexrelease>\let\ulcdefault\@undefined
606 <latexrelease>\let\swshape\@undefined

```

```

607 <latexrelease>\let\swdefault\@undefined
608 <latexrelease>\let\sscshape\@undefined
609 <latexrelease>\let\sscdefault\@undefined
610 <latexrelease>
611 <latexrelease>\EndIncludeInRelease

```

## 2.2 Changing to a new shape

```

612 <*2kernel | latexrelease>
613 <latexrelease>\IncludeInRelease{2021/06/01}%
614 <latexrelease> {\fontshape}{Font shape change}%

```

`\fontshape` Again the `\fontshape` now has to do a lookup to get to its new value in `\f@shape`. The method is exactly the same as in `\fontseries`.

```

615 \DeclareRobustCommand\fontshape[1]
616   {\expandafter\def\expandafter\delayed@f@adjustment\expandafter
617     {\delayed@f@adjustment\delayed@merge@font@shape{#1}}}

```

*(End definition for \fontshape.)*

`\fontshapeforce` The unconditional version:

```

618 \DeclareRobustCommand\fontshapeforce[1]
619   {\expandafter\def\expandafter\delayed@f@adjustment\expandafter
620     {\delayed@f@adjustment\edef\f@shape{#1}}}

```

*(End definition for \fontshapeforce.)*

Supporting rollback ...

```

621 </2kernel | latexrelease>
622 <latexrelease>\EndIncludeInRelease
623 <latexrelease>\IncludeInRelease{2020/02/02}%
624 <latexrelease> {\fontshape}{Font shape change}%
625 <latexrelease>
626 <latexrelease>\DeclareRobustCommand\fontshape[1]{\merge@font@shape{#1}}
627 <latexrelease>\DeclareRobustCommand\fontshapeforce[1]{\edef\f@shape{#1}}
628 <latexrelease>
629 <latexrelease>\EndIncludeInRelease

630 <latexrelease>\IncludeInRelease{0000/00/00}%
631 <latexrelease> {\fontshape}{Font shape change}%
632 <latexrelease>
633 <latexrelease>\DeclareRobustCommand\fontshape [1]{\edef\f@shape{#1}}
634 <latexrelease>\let\fontshapeforce\@undefined
635 <latexrelease>
636 <latexrelease>\EndIncludeInRelease

637 <*2kernel | latexrelease>
638 <latexrelease>\IncludeInRelease{2020/02/02}%
639 <latexrelease> {\merge@font@shape}{Font shape change rules}%

```

`\merge@font@shape` Look up the database entry (if existing) and act accordingly.

```

640 \def\merge@font@shape#1{%
641   \expandafter\expandafter\expandafter
642   \merge@font@shape@
643   \csname shape@\f@shape @#1\endcsname
644   {#1}%

```

```

645     \@nil
646 }

```

(End definition for \merge@font@shape.)

**\merge@font@shape@** Same game now, except that we look at shapes not series values and we can set the shape without the complication of dropping “m”s from the name as we had to for the series.

```

647 \def\merge@font@shape@#1#2#3\@nil{%
648   \def\reserved@a{#3}%
649   \ifx\reserved@a\@empty
650     \edef\f@shape{#2}%
651   \else

```

\reserved@a is used in \@font@shape@subst@warning so we have to define it in addition to do the \ifcsname test

```

652     \edef\reserved@a{\f@encoding /\f@family /\f@series/#1}%
653     \ifcsname \reserved@a\endcsname
654       \edef\f@shape{#1}%
655     \else
656       \ifcsname \f@encoding /\f@family /\f@series/#2\endcsname
657         \edef\f@shape{#2}%
658         \@font@shape@subst@warning
659       \else
660         \edef\f@shape{#3}%
661         \@font@shape@subst@warning
662       \fi
663     \fi
664   \fi
665 }

```

(End definition for \merge@font@shape@.)

**\merge@font@shape@without@substitution** See definition of \selectfont for how these macros are used.

**\merge@font@shape@without@substitution@**  
**\delayed@merge@font@shape**

```

666 \def\merge@font@shape@without@substitution#1{%
667   \expandafter\expandafter\expandafter
668   \merge@font@shape@without@substitution@
669   \csname shape@\f@shape @#1\endcsname
670   {#1}%
671   \@nil
672 }

673 \def\merge@font@shape@without@substitution@#1#2#3\@nil{%
674   \def\reserved@a{#3}%
675   \ifx\reserved@a\@empty
676     \edef\f@shape{#2}%
677   \else
678     \edef\f@shape{#1}%
679   \fi
680 }

681 \let\delayed@merge@font@shape\merge@font@shape@without@substitution

```

(End definition for \merge@font@shape@without@substitution,  
\merge@font@shape@without@substitution@, and \delayed@merge@font@shape.)

`\normalshape` `\normalshape` resets both sub-axes if the default rules are used.

```

682 \protected\def\normalshape
683   {\not@math@alphabet\normalshape\relax
684    \fontshape\shapedefault\selectfont}%

```

*(End definition for \normalshape.)*

### 3 Make sure we win ...

This code implements one aspect of what the package `fontaxes` provide. So its redefinitions for the various shape commands, such as `\itshape` should no longer happen. We therefore force the standard definitions at `\AtBeginDocument` (later when this is defined. Once `fontaxes` is no longer doing such redefinitions that could be taken out again.

We use a separate macro so that we can easily disable this (in case of rollback).

`\reinstall@nfss@defs` I use `\protected` here not `\DeclareRobustCommand` to avoid extra status lines.

```

685 \def\reinstall@nfss@defs{%
686   \protected\def\upshape
687     {\not@math@alphabet\upshape\relax
688      \fontshape\updefault\selectfont}%
689   \protected\def\slshape
690     {\not@math@alphabet\slshape\relax
691      \fontshape\sldefault\selectfont}%
692   \protected\def\scshape
693     {\not@math@alphabet\scshape\relax
694      \fontshape\scdefault\selectfont}%
695   \protected\def\itshape
696     {\not@math@alphabet\itshape\mathit
697      \fontshape\itdefault\selectfont}%
698   \protected\def\ulcshape
699     {\not@math@alphabet\ulcshape\relax
700      \fontshape\ulc\selectfont}%
701   \protected\def\swshape
702     {\not@math@alphabet\swshape\relax
703      \fontshape\swdefault\selectfont}%
704   \protected\def\sscshape
705     {\not@math@alphabet\sscshape\relax
706      \fontshape\sscdefault\selectfont}%
707 }

```

*(End definition for \reinstall@nfss@defs.)*

Supporting rollback ...

```

708 </2kernel | latexrelease>
709 <latexrelease>\EndIncludeInRelease
710 <latexrelease>\IncludeInRelease{0000/00/00}%
711 <latexrelease>  {\merge@font@shape}{Font shape change rules}%
712 <latexrelease>
713 <latexrelease>\DeclareRobustCommand\fontshape [1]{\edef\f@shape{#1}}
714 <latexrelease>\let\fontshapeforce\undefined
715 <latexrelease>
716 <latexrelease>\let\merge@font@shape\undefined
717 <latexrelease>\let\merge@font@shape@\undefined
718 <latexrelease>

```



```

719 <latexrelease>\let\merge@font@shape@without@substitution\@undefined
720 <latexrelease>\let\merge@font@shape@without@substitution@\@undefined
721 <latexrelease>\let\delayed@merge@font@shape\@undefined
722 <latexrelease>
723 <latexrelease>\let\normalshape\@undefined
724 <latexrelease>

```

This is always called in `\document` so don't make it undefined.

```

725 <latexrelease>
726 <latexrelease>\let\reinstall@nfss@defs\relax
727 <latexrelease>\EndIncludeInRelease

```

This initializes the 2020/02/02 extensions to NFSS after any changes in the preamble.

```

728 <*2kernel | latexrelease>
729 <latexrelease>\IncludeInRelease{2020/10/01}%
730 <latexrelease>                {\reinstall@nfss@defs}{NFSS series init}%
731 \g@addto@macro\@kernel@after@begindocument@before
732                {\reinstall@nfss@defs\init@series@setup}
733 </2kernel | latexrelease>
734 <latexrelease>\EndIncludeInRelease

```

The initialization was introduced in 2020/02/02 but

```

735 <latexrelease>\IncludeInRelease{2020/02/02}%
736 <latexrelease>                {\reinstall@nfss@defs}{NFSS series init}%
737 <latexrelease>\AtBeginDocument{\reinstall@nfss@defs\init@series@setup}
738 <latexrelease>\EndIncludeInRelease
739 <latexrelease>\IncludeInRelease{0000/00/00}%
740 <latexrelease>                {\reinstall@nfss@defs}{NFSS series init}%
741 <latexrelease>\EndIncludeInRelease
742 <*2kernel>
743 </2kernel>

```

# File x

## ltfsstrc.dtx

### 1 Introduction

This package contains the code for tracing font loading and font changes. It basically overlays some of the low-level functions of NFSS with additional code used for tracing.

The package accepts the following options:

**errorshow** Write all information about font changes etc. only to the transcript file unless an error happens. This means that information about font substitution will not be shown on the terminal.

**warningshow** Show all NFSS warnings on the terminal. This setting corresponds to the default behaviour of NFSS if the `tracefnt` package is *not* loaded!

**infoshow** Show all NFSS warning and all NFSS info messages (that are normally only written to the transcript file) also on the terminal. This is the default if the `tracefnt` package is loaded.

**debugshow** In addition to **infoshow** show also changing of math fonts as far as possible (this option can produce a large amount of output).

**loading** Show the name of external fonts when they are loaded. This option shows only “newly” loaded fonts not those already preloaded in the format or the class file before the `tracefnt` package became active.

**pausing** Turn all font warnings into errors so that L<sup>A</sup>T<sub>E</sub>X will stop.

### 2 A driver for this document

The next bit of code contains the documentation driver file for T<sub>E</sub>X, i.e., the file that will produce the documentation you are currently reading. It will be extracted from this file by the DOCSTRIP program.

When this file is processed directly by L<sup>A</sup>T<sub>E</sub>X this will produce the documentation as well.

```
1 <*driver>
2 \documentclass{ltxdoc}
3
4
5 %\OnlyDescription % comment out for implementation details
6
7 \begin{document}
8   \DocInput{ltfsstrc.dtx}
9 \end{document}
10 </driver>
```

### 3 The Implementation

**Warning:** Read the macro documentation with a grain of salt. It is still basically the documentation from the first NFSS release and therefore in some cases probably not completely accurate.

If we are making a package file it is a good idea to test whether we are running under 2e. This code is actually placed at the very beginning of this file for easier maintenance, thus commented out here.

```
11 <*package>
12 %\NeedsTeXFormat{LaTeX2e}
13 %\ProvidesPackage{tracefnt}[??/??/?? v?.??]
14 %
15 </package>
16 % Standard LaTeX package (font tracing)
```

The `debug` module makes use of commands contained in a special package file named `trace.sty`.<sup>25</sup>

```
16 <+debug> \input trace.sty
```

### 4 Handling Options

`\tracingfonts` Here is the definition of the integer register for the font trace. As a default in a package file we use 1 to give error messages if fonts are substituted. If this code is used for debugging or tracing reasons in the format file (i.e. in `fam.dtx`) we use 0 as the default. But if no font trace is used we build a definition that will produce a warning message.

```
17 <*2ekernel>
18 \def\tracingfonts{%
19   \@font@warning{Command \noexpand\tracingfonts
20     not provided.\MessageBreak
21     Use the ‘tracefnt’ package.\MessageBreak Command found:}%
22   \count@}
23 </2ekernel>
```

The `\count@` in the line above will remove the number after `\tracingfonts`. Note that this definition will be overwritten by the next line if one of these modules are included.

```
24 <*package, trace, debug>
25 \newcount\tracingfonts
26 \tracingfonts=0
27 </package, trace, debug>
```

*(End definition for \tracingfonts.)*

The option `errorshow` turns off all warnings so that only real errors are shown. `warningshow` corresponds to the NFSS default (when `tracefnt` is not loaded). `infoshow` is the default for this package here; and `debugshow`, `loading`, and `pausing` extend the amount of information even further.

```
28 <*package>
29 \DeclareOption{errorshow}{%
30   \def\@font@info#1{%
31     \GenericInfo{(Font)}\@spaces\@spaces\@spaces\space\space}%
32     {LaTeX Font Info: \space\space\space#1}}%
```

---

<sup>25</sup>This package is not in distribution at the moment (and probably doesn't any longer work). Think of this part of the code as being historical artifacts.

```

33 \def\@font@warning#1{%
34     \GenericInfo{(Font)\@spaces\@spaces\@spaces\space\space}%
35     {LaTeX Font Warning: #1}}%
36 }
37 \DeclareOption{warningshow}{%
38     \def\@font@info#1{%
39         \GenericInfo{(Font)\@spaces\@spaces\@spaces\space\space}%
40         {LaTeX Font Info: \space\space\space#1}}%
41     \def\@font@warning#1{%
42         \GenericWarning{(Font)\@spaces\@spaces\@spaces\space\space}%
43         {LaTeX Font Warning: #1}}%
44     }
45 \DeclareOption{infoshow}{%
46     \def\@font@info#1{%
47         \GenericWarning{(Font)\@spaces\@spaces\@spaces\space\space}%
48         {LaTeX Font Info: \space\space\space#1}}%
49     \def\@font@warning#1{%
50         \GenericWarning{(Font)\@spaces\@spaces\@spaces\space\space}%
51         {LaTeX Font Warning: #1}}%
52     }
53 \DeclareOption{loading}{%
54     \tracingfonts\tw@
55 }
56 \DeclareOption{debugshow}{%
57     \ExecuteOptions{infoshow}%
58     \tracingfonts\thr@@
59 }
60 \DeclareOption{pausing}{%
61     \def\@font@warning#1{%
62         \GenericError
63         {(Font)\@spaces\@spaces\@spaces\space\space}%
64         {LaTeX Font Warning: #1}%
65         {See the LaTeX Companion for details.}%
66         {I'll stop for every LaTeX Font Warning because
67          you requested\MessageBreak the 'pausing' option
68          to the tracefont package.}}%
69     }

```

We make `infoshow` the default, which in turn defines `\font@warning` and `\font@info`.

```

70 \ExecuteOptions{infoshow}
71 \ProcessOptions
72 \</package>

```

We also need a default definition inside the kernel:

```

73 \<2kernel>
74 \def\@font@info#1{%
75     \GenericInfo{(Font)\@spaces\@spaces\@spaces\space\space}%
76     {LaTeX Font Info: \space\space\space#1}}%
77 \def\@font@warning#1{%
78     \GenericWarning{(Font)\@spaces\@spaces\@spaces\space\space}%
79     {LaTeX Font Warning: #1}}%
80 \</2kernel>

```

## 5 Macros common to fam.tex and tracefmt.sty

In the first versions of `tracefmt.dtx` some macros of `fam.dtx`<sup>26</sup> were redefined to include the extra tracing information. Now these macros are all defined in this file (i.e. removed from `fam.dtx`) and different production versions can be obtained simply by specifying a different set of modules to include when generating `lftss.dtx`.

### 5.1 General font loading

`\extract@font` This macro organizes the font loading. It first calls `\get@external@font` which will return in `\external@font` the name of the external font file (the `.tfm`) as it was determined by the NFSS tables.

```
81 <*2ekernel|package>
82 \def\extract@font{%
83   \get@external@font
```

Then the external font is loaded and assigned to the font identifier stored inside `\font@name` (for this reason we need `\expandafter`).

```
84   \global\expandafter\font\font@name\external@font\relax
```

When tracing we typeout the internal and external font name.

```
85 <*trace>
86   \ifnum \tracingfonts >\@ne
87   \@font@info{External font '\external@font'
88               loaded as\MessageBreak \font@name}\fi
89 </trace>
```

Finally we call the corresponding “loading action” macros to finish things. First the font is locally selected to allow the use of `\font` inside the loading action macros.

```
90   \font@name \relax
```

The next two lines execute the “loading actions” for the family and then for the individual font shape.

```
91   \csname \f@encoding+\f@family\endcsname
92   \csname\curr@fontshape\endcsname
93   \relax
94   }
95 </2ekernel|package>
```

The `\relax` at the end needs to be explained. This is inserted to prevent `TEX` from scanning too far when it is executing the replacement text of the loading code macros.

*(End definition for \extract@font.)*

`\get@external@font` This function tries to find an external font name. It will place the name into the macro `\external@font`. If no font is found it will return the one that was defined via `\DeclareErrorFont`.

```
96 <*2ekernel>
97 \def\get@external@font{%
```

We don’t know the external font name at the beginning.

```
98   \let\external@font\@empty
99   \edef\font@info{\expandafter\expandafter\expandafter\string
100                  \csname \curr@fontshape \endcsname}%
101   \try@size@range
```

---

<sup>26</sup>This file is currently not distributed in documented form. Its code is part of `lftss.dtx`.

If this failed, we'll try to substitute another size of the same font. This is done by the `\try@size@substitution` macro. It “knows about” `\do@extract@font`, `\font@name`, `\f@size`, and so on.

```

102 \ifx\external@font\@empty
103 \try@size@substitution
104 \ifx\external@font\@empty
105 \latex@error{Font \expandafter \string\font@name\space
106 not found}\@eha
107 \error@fontshape
108 \get@external@font
109 \fi\fi
110 }
111 \end{kernel}

```

(End definition for `\get@external@font`.)

```

112 \*2kernel | latexrelease | package
113 \latexrelease\IncludeInRelease{2021/06/01}%
114 \latexrelease\selectfont\{Add hook to \selectfont}%

```

`\selectfont` The macro `\selectfont` is called whenever a font change must take place.

```

115 \DeclareRobustCommand\selectfont
116 {

```

When `debug` is specified we actually want something like ‘`undebug`’. The font selection is now stable so that using `\tracingall` on some other macros will show us a lot of unwanted information about font loading. Therefore we disable tracing during font loading as long as `\tracingfonts` is less than 4.

```

117 \+debug\pushtracing
118 \+debug\ifnum\tracingfonts<4\tracingoff
119 \+debug\else\tracingon\p\selectfont\fi

```

If `\baselinestretch` was redefined by the user it will not longer match its internal counterpart `\f@linespread`. If so we call `\set@fontsize` to prepare `\size@update`.

```

120 \ifx\f@linespread\baselinestretch\else
121 \set@fontsize\baselinestretch\f@size\f@baselineskip\fi

```

The series and shape updates are only prepared by `\fontseries` and `\fontshape` but not executed until after we are ready to change the font face. This way they happen after a possibly new family is set which is important because they look at the available font faces in that family and alter the selection based on availability. Several calls to `\fontseries` or `\fontshape` are delayed in the order in which they appear, so that by switching them one can work around missing intermediate font faces and avoid substitutions.

We first attempt to do the merge without any substitution. As we might end up with a non-existing font face we may have to restart and therefore save the current values of `\f@series` and `\f@shape` before the merge.

But first we make a quick test to see if there are any delayed actions, because if not it is pointless to make all the assignments and try loading a missing fontshape.

```

122 \ifx\delayed@f@adjustment\@empty
123 \else
124 \let\f@shape@savd\f@shape
125 \let\f@series@savd\f@series

```

The we run the delayed adjustments (which is using the `\..@without@substitution` commands

```
126      \delayed@f@adjustment
```

We then check if the resulting combination is valid but for this we have to make sure that the appropriate `.fd` is loaded if that hasn't happened so far.

```
127      \maybe@load@fontshape
```

```
128      \ifcsname \f@encoding/\f@family/\f@series/\f@shape \endcsname
```

If this macro is defined then we are good and no further action is necessary.

Otherwise the combination is not valid, so we redo the merge but this time with substitutions.

```
129      \else
```

```
130          \let\f@shape\f@shape@saved
```

```
131          \let\f@series\f@series@saved
```

```
132          \let\delayed@merge@font@shape\merge@font@shape
```

```
133          \let\delayed@merge@font@series\merge@font@series
```

```
134          \delayed@f@adjustment
```

```
135          \let\delayed@merge@font@shape\merge@font@shape@without@substitution
```

```
136          \let\delayed@merge@font@series\merge@font@series@without@substitution
```

```
137      \fi
```

Now the series and shape values are updated and we clear `\delayed@f@adjustment`. This is important because on the next execution of `\selectfont` we should not mistakenly redo the delayed actions if there wasn't any series or shape change.

```
138      \let\delayed@f@adjustment\@empty
```

```
139      \fi
```

If the series was forced we should now cancel that in case the next series change is done with some low-level setting to `\f@series`.

```
140      \@forced@seriesfalse
```

Then we generate the internal name of the font by concatenating *family*, *series*, *shape*, and current *size*, with slashes as delimiters between them. This is much more readable than standard L<sup>A</sup>T<sub>E</sub>X's `\twbf`, etc. We define `\font@name` globally, as always. The reason for this is explained later on.

```
141      \xdef\font@name{%
```

```
142          \csname\curr@fontshape/\f@size\endcsname}%
```

We call the macro `\pickup@font` which will load the font if necessary.

```
143      \pickup@font
```

Then we select the font.

```
144      \font@name
```

After switching fonts we run a hook, so that packages can make last minute alterations based on the new font (originally provided in `every` but using a different interface).

```
145      \UseHook{selectfont}%
```

Finally we call `\size@update`. This macro is normally empty but will contain actions (like setting the `\baselineskip`) that have to be carried out when the font size, the base `\baselineskip` or the `\baselinestretch` have changed.

```
146      \size@update
```

A similar function is called to handle anything related to encoding updates. This one is changed from `\relax` by `\fontencoding`.

```
147 \enc@update
```

Just before ending this macro we have to pop the tracing stack if it was pushed before.

```
148 <+debug> \poptracing
149 }
```

(End definition for `\selectfont`.)

**selectfont** Declare the hook used in `selectfont` in the kernel, but not inside the `tracefnt` package.

```
150 <-trace>\NewHook{selectfont}
```

(End definition for `selectfont`.)

If `\tracingfonts` is greater than 2 we also show the font switch inside `\selectfont`. We do this by adding this code to the hook in the `tracefnt` package: macro might redefine `\font@name`.

```
151 <*trace>
152 \AddToHook{selectfont}
153   {\ifnum \tracingfonts>\tw@
154     \font@info{Switching to \font@name}\fi}
155 </trace>
156 </2ekernel | latexrelease | package>
157 <latexrelease>\EndIncludeInRelease
```

With `\selectfont` having different definitions in different kernels we also have to provide them in the `tracefnt` package to support rollback. In packages that works a bit differently and therefore we have to provide an empty block there.

```
158 <package>\IncludeInRelease{2021/06/01}%
159 <package>          {\selectfont}{Add hook to \selectfont}%
160 <package>\EndIncludeInRelease

161 <latexrelease | package>\IncludeInRelease{0000/00/00}%
162 <latexrelease | package>          {\selectfont}{Add hook to \selectfont}%
163 <latexrelease | package>
164 <latexrelease | package>\DeclareRobustCommand\selectfont
165 <latexrelease | package>  {%
166 <latexrelease | package>    \ifx\f@linespread\baselinestretch \else
167 <latexrelease | package>    \set@fontsize\baselinestretch\f@size\f@baselineskip \fi
168 <latexrelease | package>    \xdef\font@name{%
169 <latexrelease | package>      \csname\curr@fontshape/\f@size\endcsname}%
170 <latexrelease | package>    \pickup@font
171 <latexrelease | package>    \font@name
172 <latexrelease | package>    \size@update
173 <latexrelease | package>    \enc@update
174 <latexrelease | package>  }
175 <latexrelease | package>
176 <latexrelease | package>\EndIncludeInRelease
```

**\set@fontsize** The macro `\set@fontsize` does the actual work. First it assigns new values to `\f@size`, `\f@baselineskip` and `\f@linespread`.

```
177 <*2ekernel | package>
178 \def\set@fontsize#1#2#3{%
179   \@defaultunits\@tempdimb#2pt\relax\@nnil
```



```

180 \edef\f@size{\strip@pt\@tempdimb}%
181 \@defaultunits\@tempskipa#3pt\relax\@nnil
182 \edef\f@baselineskip{\the\@tempskipa}%
183 \edef\f@linespread{#1}%

```

For backward compatibility and for later testing within `\selectfont` the internal value of `\f@linespread` is passed back to `\baselinestretch`.

```

184 \let\baselinestretch\f@linespread

```

Additional processing will happen within `\selectfont`. For this reason the macro `\size@update` (which will be called in `\selectfont`) will be defined to be:

```

185 \def\size@update{%

```

First calculate the new `\baselineskip` and also store it in `normalbaselineskip`

```

186 \baselineskip\f@baselineskip\relax
187 \baselineskip\f@linespread\baselineskip
188 \normalbaselineskip\baselineskip

```

then to set up a new `\strutbox`

```

189 \setbox\strutbox\hbox{%
190 \vrule\@height.7\baselineskip
191 \@depth.3\baselineskip
192 \@width\z@}%

```

We end with a bit of tracing information.

```

193 \<trace>
194 \ifnum \tracingfonts>\tw@
195 \ifx\f@linespread\@empty
196 \let\reserved@a\@empty
197 \else
198 \def\reserved@a{\f@linespread x}%
199 \fi
200 \font@info{Changing size to \f@size/\reserved@a
201 \f@baselineskip}%
202 \aftergroup\type@restoreinfo \fi
203 \</trace>

```

When all this is processed `\size@update` redefines itself to `\relax` so that in later calls of `\selectfont` no extra code will be executed.

```

204 \let\size@update\relax}%
205 }

```

Instead of defining this macro internally we might speed things up by placing the code into a separate macro and use `\let`!

*(End definition for \set@fontsize.)*

**\size@update** Normally this macro does nothing; it will be redefined by `\set@fontsize` to initiate an update.

```

206 \let\size@update\relax

```

*(End definition for \size@update.)*

`\type@restoreinfo` This macro produces some info when a font size and/or baseline change will get restored.

```

207 < *trace >
208   \def\type@restoreinfo{%
209     \ifx\f@linespread\@empty
210       \let\reserved@a\@empty
211     \else
212       \def\reserved@a{\f@linespread x}%
213     \fi
214     \@font@info{Restoring size to
215               \f@size/\reserved@a\f@baselineskip}}
216 < /trace >

```

(End definition for `\type@restoreinfo`.)

`\glb@settings` The macro `\glb@settings` globally selects all math fonts for the current size if necessary.

`\glb@currsz` `\def\glb@settings{%`

When `\glb@settings` gains control a size change was requested and all previous font assignments need to be replaced. Therefore the old values of the fonts are no longer needed. For every *math group* the new assignments are appended to `\math@fonts`. But this happens only if the `\math@fonts` switch is set to true. However, we always set up the correct math sizes for script and scriptscript fonts since they may be needed even if we don't set up the whole math machinery.

Here we set the math size, script size and scriptscript size. If the `S@...` macro is not defined we have to first calculate the three sizes.

```

218   \expandafter\ifx\csname S@\f@size\endcsname\relax
219     \calculate@math@sizes
220   \fi

```

The effect of this is that `\calculate@math@sizes` may or may not define the `S@...` macro. In the first case the next time the same size is requested this macro is used, otherwise `\calculate@math@sizes` is called again. This also sets the `\math@fonts` switch. If it is true we must switch the math fonts.

```

221   \csname S@\f@size\endcsname
222   \ifmath@fonts
223 < *trace >
224     \ifnum \tracingfonts>\tw@
225       \@font@info{Setting up math fonts for
226                 \f@size/\f@baselineskip}\fi
227 < /trace >

```

Inside a group we execute the macro for the current math *version*. This sets `\math@fonts` to a list of `\textfont...` assignments. `\getanddefine@fonts` (which may be called at this point) needs the `\escapechar` parameter to be set to `-1`.

```

228   \begingroup
229     \escapechar\m@ne
230     \csname mv@\math@version \endcsname

```

Then we set `\globaldefs` to 1 so that all following changes are done globally. The math font assignments recorded in `\math@fonts` are executed and `\glb@currsz` is set equal to `\f@size`. This signals that the fonts for math in this size are set up.

```

231     \globaldefs\@ne
232     \math@fonts

```

```

233         \let \glb@currsiz e \f@size
234     \endgroup

```

Finally we execute any code that is supposed to happen whenever the math font setup changes. This register will be executed in local mode which means that everything that is supposed to have any effect should be done globally inside. We can't execute it within `\globaldefs\@ne` as we don't know what ends up inside this register, e.g., it might contain calculations which use some local registers to calculate the final (global) value.

```

235     \the\every@math@size

```

Otherwise we announce that the math fonts are not set up for this size.

```

236 \< *trace>
237     \else
238         \ifnum \tracingfonts>\tw@
239             \@font@info{No math setup for
240                         \f@size/\f@baselineskip}\fi
241 \< /trace>
242     \fi
243 }
244 \< /2ekernel | package>

```

*(End definition for \glb@settings and \glb@currsiz e.)*

**\baselinestretch** In `\selectfont` we used `\baselinestretch` as a factor when assigning a value to `\baselineskip`. We use 1 as a default (i.e. no stretch).

```

245 \< *2ekernel>
246 \def\baselinestretch{1}

```

*(End definition for \baselinestretch.)*

**\every@math@size** We must still define the hook `\every@math@size` we used in `\glb@settings`. We initialize it to nothing. It is important to remember that everything that goes into this hook should to global updates, local changes will have weird effects.

```

247 \newtoks\every@math@size
248 \every@math@size={}
249 \< /2ekernel>

```

*(End definition for \every@math@size.)*

## 5.2 Math fonts setup

### 5.2.1 Outline of algorithm for math font sizes

$\TeX$  uses the math fonts that are current when the end of a formula is reached. If we don't want to keep font setups local to every formula (which would result in an enormous overhead, we have to be careful not to end up with the wrong setup in case formulas are nested, e.g., we need to be able to handle

$\$ a=b+c \mathrel{\mathop{\boxtimes}} \mathrel{\mathop{\small}} \text{for all } b \text{ and } c \text{ in } \mathbb{Z} \$$

Here the inner formulae  $b$  and  $c \text{ in } \mathbb{Z}$  are typeset in `\small` but we have to return to `\normalsize` before we reach the closing `\$` of the outer formula.

This is handled in the following way:

1. At any point in the document the global variable `\glb@currsiz e` contains the point size for which the math fonts currently are set up.

2. Whenever we start a formula we compare its value with the local variable `\f@size` that describes the current text font size.
3. If both are the same we assume that we can use the current math font setup without adjustment.
4. If they differ we call `\glb@settings` which changes the math font setup and updates `\glb@currsz`.
  - (a) If we are recursively inside another formula (`\if@inmath`) we ensure that `\glb@settings` is executed again in the outer formula, so that the old setup is automatically restored.
  - (b) Otherwise, we set the switch `@inmath` locally to `true` so that all nested formulae will be able to detect that they are nested in some outer formula.

The above algorithm has the following features:

- For sizes which are not containing any formula no math setup is done. Compared to the original algorithm of NFSS this results in the following savings:
  - No unnecessary loading of math fonts for sizes that are not used to typeset any math formulae (explicit or implicit ones).
  - No time overhead due to unnecessary changes of the math font setup on entrance and exit of the text font size.
- Math font setup changes for top-level formulae will survive (there is no restoration after the formula) thus any following formula in the same size will be directly typesettable. Compared to original implementation in NFSS2 the new algorithm has the overhead of one test per formula to see if the current math setup is valid (in the original algorithm the setup was always valid, thus no test was necessary).
- In nested formulae the math font setup is restored in the outer formula by a series of `\aftergroup` commands and checks. Compared to the original algorithm this involves additional checks ( $2 \times \langle \text{non-math levels} \rangle$  per inner formula).

### 5.2.2 Code for math font size setting

`\check@mathfonts` In the `\check@mathfonts` macros we implement the steps 2 to 4 except that instead of a switch the macro `\init@restore@glb@settings` is used.

```

250 <*2kernel | package>
251 \def\check@mathfonts{%
252   \ifx \glb@currsz \f@size
253   <*trace>
254     \ifnum \tracingfonts>\thr@@
255       \@font@info{*** MATH: no change \f@size\space
256         curr/global (\curr@math@size/\glb@currsz)}\fi
257   </trace>
258   \else
259   <*trace>
260     \ifnum \tracingfonts>\thr@@
261       \@font@info{*** MATH: setting up \f@size\space
262         curr/global (\curr@math@size/\glb@currsz)}\fi
263   </trace>

```

```

264     \glb@settings
265     \init@restore@glb@settings
266   \fi
267   \let\curr@math@size\font@size
268   \def\init@restore@glb@settings{\aftergroup\restglb@settings}%
269 }

```

(End definition for \check@mathfonts.)

**\init@restore@glb@settings** This macro does by default nothing but get redefined inside \check@mathfonts to initiate fontsize restoring in nested formulas.

```

270 <-trace>\let\init@restore@glb@settings\relax
271 <*trace>
272 \def\init@restore@glb@settings{%
273     \ifnum \tracingfonts>\thr@@
274     \@font@info{*** MATH: no resetting (not in
275                 nested math)}\fi
276 }
277 </trace>

```

(End definition for \init@restore@glb@settings.)

**\restglb@settings** This macro will be executed the first time after the current formula.

```

278 \def\restglb@settings{%
279 <*trace>
280     \ifnum \tracingfonts>\thr@@
281     \@font@info{*** MATH: restoring}\fi
282 </trace>
283     \begingroup
284     \let\font@size\curr@math@size
285     \ifx\glb@currsz \font@size
286 <*trace>
287     \ifnum \tracingfonts>\thr@@
288     \@font@info{*** MATH: ... already okay (\font@size)}\fi
289 </trace>
290     \else
291 <*trace>
292     \ifnum \tracingfonts>\thr@@
293     \@font@info{*** MATH: ... to \font@size}\fi
294 </trace>
295     \glb@settings
296   \fi
297 \endgroup
298 }

```

(End definition for \restglb@settings.)

### 5.2.3 Other code for math

**\use@mathgroup** The \use@mathgroup macro should be used in user macros to select a math group. Depending on whether or not the margid option is in force it has two or three arguments. For this reason it should be called as the last macro.

First we test if we are inside math mode since we don't want to apply a useless definition.

```

299 \def\use@mathgroup#1#2{\relax\ifmmode

```

```

300 <*trace>
301   \ifnum \tracingfonts>\tw@
302     \count@#2\relax
303     \@font@info{Using \noexpand\mathgroup
304       (\the\count@) #2}\fi
305 </trace>

```

If so we first call the ‘=’ macro (i.e. argument three) to set up special things for the selected math group. Then we call `\mathgroup` to select the group given by argument two and finally we place `#1` (i.e. the argument of the *math alphabet identifier*) at the end. This part of the code is surrounded by two commands which behave like `\begingroup` and `\endgroup` if we want *math alphabet identifier*s but will expand into `\@empty` if we want simply switches to a new math group. Since argument number 2 may be a digit instead of a control sequence we add a `\relax`. Otherwise something like `\mit{1}` would switch to math group 11 (and back) instead of printing an oldstyle 1.

```

306   \math@bgroup
307     \expandafter\ifx\csname M@\f@encoding\endcsname#1\else
308       #1\fi
309     \mathgroup#2\relax

```

Before we reinsert the swallowed token (arg. three) into the input stream, in the case that the *math alphabet identifier* isn’t called in math mode, we remove the `\fi` with the `\expandafter` trick. This is necessary if the token is actually an macro with arguments. In such a case the `\fi` will be misinterpreted as the first argument which would be disastrous.

```

310   \expandafter\math@egroup\fi}%

```

The surrounding macros equal `\begingroup` and `\endgroup`. But using internal names makes it possible to overwrite their meaning in certain cases. This is for example used in  $\mathcal{S}$ -TeX macros for placing accents.

(End definition for `\use@mathgroup`.)

`\math@egroup` If the `margid` option is in force (which can be tested by looking at the definition of `\math@bgroup` we change the `\math@egroup` command a bit to display the current *math group number* after it closes the scope of *math alphabet* with `\endgroup`.

```

311 <*trace>
312   \ifx\math@bgroup\bgroup
313     \def\math@egroup#1{#1\egroup
314       \ifnum \tracingfonts>\tw@
315         \@font@info{Restoring \noexpand\mathgroup
316           (\ifnum\mathgroup=\m@ne default\else \the\mathgroup \fi)%
317         }\fi}
318   \fi
319 </trace>

```

(End definition for `\math@egroup`.)

`\getanddefine@fonts` `\getanddefine@fonts` has two arguments: the *math group number* and the *family/series/shape* name as a control sequence.

```

320 \def\getanddefine@fonts#1#2{%

```

First we turn of tracing when `\tracingfonts` is less than 4.

```

321 <+debug>   \pushtracing
322 <+debug>   \ifnum\tracingfonts<4 \tracingoff
323 <+debug>   \else \tracingon\getanddefine@fonts \fi

```

```

324 <*trace>
325   \ifnum \tracingfonts>\tw@
326   \count#1\relax
327   \@font@info{\noexpand\mathgroup (\the\count@) #1 :=\MessageBreak
328               \string#2 \tf@size/\sf@size/\ssf@size}\fi
329 </trace>

```

We append the current `\tf@size` to #2 to obtain the font name.<sup>27</sup> Again, `font@name` is defined globally, for the reasons explained in the description of `\wrong@fontshape`.

```

330   \xdef\font@name{\csname \string#2/\tf@size\endcsname}%

```

Then we call `\pickup@font` to load it if necessary. We remember the internal name as `\textfont@name`.

```

331   \pickup@font \let\textfont@name\font@name

```

Same game for `\scriptfont` and `\scriptscriptfont`:

```

332   \xdef\font@name{\csname \string#2/\sf@size\endcsname}%
333   \pickup@font \let\scriptfont@name\font@name
334   \xdef\font@name{\csname \string#2/\ssf@size\endcsname}%
335   \pickup@font

```

Then we append the new `\textfont...` assignments to the `\math@fonts`.

```

336   \edef\math@fonts{\math@fonts
337                   \textfont#1\textfont@name
338                   \scriptfont#1\scriptfont@name
339                   \scriptscriptfont#1\font@name}%

```

Just before ending this macro we have to pop the tracing stack if it was pushed before.

```

340 <+debug> \poptracing
341   }
342 </2ekernel | package>

```

(End definition for `\getanddefine@fonts`.)

## 6 Scaled font extraction

`\ifnot@nil` We begin with a simple auxiliary macro. It checks whether its argument is the token `\@nil`. If so, it expands to `\@gobble` which discards the following argument, otherwise it expands to `\@firstofone` which reproduces its argument.

```

343 <*2ekernel>
344 \def\ifnot@nil#1{\def\reserved@a{#1}%
345   \ifx\reserved@a\@nnil \expandafter\@gobble
346   \else \expandafter\@firstofone\fi}

```

(End definition for `\ifnot@nil`.)

`\remove@to@nnil` Three other auxiliary macros will be needed in the following: `\remove@to@nnil` gobbles up everything up to, and including, the next `\@nnil` token, and `\remove@angles` and `\remove@star` do the same for the character `>` and `*`, respectively, instead of `\@nnil`.

```

347 \def\remove@to@nnil#1\@nnil{}
348 \def\remove@angles#1>{\set@simple@size@args}
349 \def\remove@star#1*{#1}

```

---

<sup>27</sup>One might ask why this expansion does not generate a macro name that starts with an additional `\` character. The solution is that `\escapechar` is set to `-1` before `\getanddefine@fonts` is called.

(End definition for `\remove@to@nnil`, `\remove@angles`, and `\remove@star`.)

`\extract@sizefn` This macro takes a size specification and parses it into size function and the optional and mandatory arguments.

```

350 \def\extract@sizefn#1*#2\@nil{%
351   \if>#2>\set@size@func@args#1\@nil
352     \let\sizefn@info\@empty
353   \else\expandafter\set@size@func@args\remove@star#2\@nil
354     \def\sizefn@info{#1}\fi
355   }

```

(End definition for `\extract@sizefn`.)

`\try@simple@size` This function tries to extract the given size (specified by `\f@size`) for the requested font shape. The font information must already be present in `\font@info`. The central macro that does the real work is `\extract@fontinfo`. We will first give a simple example how this macro works, and describe it in full generality later.

Assume that the requested parameters are: *encoding scheme* ‘OT1’, *family* ‘cm’, *series* ‘sansserif’, *shape* ‘normal’, and *size* ‘12’. The corresponding font definitions have already been extracted from the macro `\OT1/cm/sansserif/normal` and stored in `font@info`. (Otherwise `\extract@fontinfo` doesn’t get called.) This information consists of a token list made of characters of category code 12 of the form

```
<10*>cmss10<12*>cmss12<17*>cmss17
```

For reasonable packages one usually needs more sizes but this is sufficient to get the flavour. We will define a macro `\extract@fontinfo` to find the external font name (‘cmss12’) for us:

```

\def\extract@fontinfo#1<12*#2>#3<#4\@nnil{%
  \set@simple@size@args#3<#4\@nnil
  \execute@size@function{#2}}

```

so that when it gets called via

```
\extract@fontinfo<10*>cmss10<12*>cmss12<17*>cmss17\@nnil
```

#1 will contain all characters before `<12*>`, #2 will be empty, #3 will be exactly `cmss12`, and #4 will be `17>cmss17`. The expansion is therefore

```

\set@simple@size@args cmss12<17*>cmss17\@nnil
\execute@size@function{}

```

This means: the default (empty) size function will be executed, with its optional argument set to empty and its mandatory argument set to `cmss12` by `\set@simple@size@args`. As we discussed earlier, the effect of the default size function is to load the given external font (`cmss12`) at the specified size (12)—which is exactly what was intended.

But this is only part of the whole story. It may be that the size requested does not occur in the token list `\font@info`. And the simple definition of `\extract@fontinfo` we gave above does not allow to specify give more than one size specification in front of the external font name.

Let’s address these two problems separately. The first one is solved with the following trick: We define `\extract@fontinfo` as follows:



```

\def\extract@fontinfo#1<12*#2>#3<#4\@nnil{%
  \ifnot@nil{#3}%
    {\set@simple@size@args#3<#4\@nnil
      \execute@size@function{#2}%
    }%
  }%
}

```

How does this work? We call `\extract@fontinfo` via

```

\expandafter\extract@fontinfo\font@info<12*>\@nil\@nnil

```

i.e. by appending `<12*>\@nil\@nnil`. If the size ('12' in this case) appears in `\font@info` everything works as explained above, the only difference being that argument #4 of `\extract@fontinfo` additionally gets the tokens `<12*>\@nil\@nnil`. However, if the size is not found everything up to the final `<12*>` is in argument #1, #3 gets `\@nil`, and #2 and #4 are empty. The macro `\ifnot@nil` will discard the calls to `\set@simple@size@args` and `\execute@size@function`, and hence `\font@info` will continue to be equal to `\@empty`. This means that no simple size specification matching the requested size could be found.

The second problem (more than one simple size specification for one external font name) will be addressed in `\set@simple@size@args` below.

The macros are hidden inside other control sequences so that we have to build `\extract@fontinfo` in several steps.

So here's the actual definition of `\extract@font` in `\try@simple@size`.

```

356 % % this could be replaced by \try@size@range making the subst slower!
357 \def\try@simple@size{%

```

`\reserved@a` is made an abbreviation for the head of the definition of the macro `\extract@fontinfo`.

```

358   \def\reserved@a{\def\extract@fontinfo####1}%

```

Now we can define `\extract@fontinfo`. Here we handle a small but convenient variation: in case of the default (empty) size function it is allowed to omit the `*` character.

```

359   \expandafter\reserved@a\expandafter<\f@size>##2<##3\@nnil{%
360     \ifnot@nil{##2}%
361       {\set@simple@size@args##2<##3\@nnil
362         \execute@size@function\sizefn@info
363       }%

```

Now we call `\extract@fontinfo`. Note the `<\@nil` tokens at the end.

```

364   \expandafter\expandafter
365   \expandafter\extract@fontinfo\expandafter\font@info
366   \expandafter<\f@size>\@nil\@nnil
367 }

```

(End definition for `\try@simple@size`.)

`\set@simple@size@args` As promised above, the macro `\set@simple@size@args` will handle the case of several size specifications in a row. If another size specification follows, the very first token of its argument list is the character `<`. By starting the definition as follows,

```

368 \def\set@simple@size@args#1<{%

```

parameter #1 is empty in this case, and contains the size function's arguments otherwise. We distinguish these two cases (Note that the character < cannot appear in #1) by calling \remove@angles for empty #1 and \extract@sizefn otherwise. In the latter case we have to take care of the remaining character tokens and discard them. This is done by \remove@to@nnil. Note also the use of Kabelschacht's method.

```

369         \if<#1<%
370         \expandafter\remove@angles
371         \else
372         \extract@sizefn#1*\@nil
373         \expandafter\remove@to@nnil
374         \fi}

```

(End definition for \set@simple@size@args.)

Now, we are through with the case of a simple size, except for calling the size function. This will be handled later, as it is the same mechanism for all types of size specification. We will now proceed to macros for extraction of size range specification.

**\extract@rangefontinfo** \extract@rangefontinfo goes through a font shape definition in the input until it recognizes the tokens <\@nil->. It looks for font ranges with font size functions. It's operation is rather simple: it discards everything up to the next size specification and passes this on to \is@range for inspection. The specification (parameter #2 is inserted again, in case it is needed later.

```

375 \def\extract@rangefontinfo#1<#2>{%
376     \is@range#2->\@nil#2>}

```

(End definition for \extract@rangefontinfo.)

**\is@range** \is@range is again a sort of dispatcher macro: if the size specification it is looking at is not a range specification it discards it and calls \extract@rangefontinfo to continue the search. Otherwise it calls \check@range to check the requested size against the specified range.

From the way \is@range is called inside \extract@rangefontinfo we see that #2 is the character > if the size specification found is a simple one (as it does not contain a - character. This is checked easily enough and \extract@rangefontinfo called again. Note that the extra tokens inserted after the \@nil in the call to \is@range appear at the beginning of the first argument to \extract@rangefontinfo and are hence ignored.

```

377 \def\is@range#1-#2\@nil{%
378     \if>#2\expandafter\check@single\else
379     \expandafter\check@range\fi}

```

(End definition for \is@range.)

**\check@range** \check@range takes lower bound as parameter #1, upper bound as #2, size function as #3 and the size function's arguments as #4. If #3 is the special token \@nil \font@info is exhausted and we can stop searching.

```

380 \def\check@range#1-#2>#3<#4\@nnil{%
381     \ifnot@nil{#3}{%

```

If #3 wasn't \@nil we have a range. We start by assuming that we have to recurse. Note that we have to reinsert an < as it was already removed by scanning.

```

382         \def\reserved@f{\extract@rangefontinfo<#4\@nnil}%

```

We have to make sure that both boundaries are present, if not we have to set them. Here we check the upper bound. If `\upper@bound` is zero after the assignment we set it to `\maxdimen` (upper open range). We need to use a *<dimen>* register for the scan since we may have a decimal number as the boundary.

```
383     \upper@bound0#2\p@
384     \ifdim\upper@bound=\z@ \upper@bound\maxdimen\fi
```

Now we check the upper boundary against `\f@size`. If it is larger or equal than `\f@size` this range is no good and we have to recurse.

```
385     \ifdim \f@size \p@<\upper@bound
```

Otherwise we have to check the lower bound. This time it is not necessary to scan the boundary value into a register because if it is empty we get zero as desired. We could even omit the 0 which would result in 1pt as default lower boundary. If `\f@size` is smaller than the boundary we have to recurse.

```
386     \lower@bound0#1\p@
387     \ifdim \f@size \p@<\lower@bound
388     \else
```

If both tests are passed we can try executing the size function.

```
389     \set@simple@size@args#3<#4\@nnil
390     \execute@size@function\sizefn@info
```

If the function was successful it should have left an external font name in `\external@font`. We use this to see if we can stop scanning. Otherwise we recurse.

```
391     \ifx\external@font\@empty
392     \else
393     \let\reserved@f\@empty
394     \fi
395     \fi
396     \fi
397     \reserved@f}}
```

(End definition for `\check@range`.)

`\lower@bound` We use two *dimen* registers `\lower@bound` and `\upper@bound` to store the lower and  
`\upper@bound` upper endpoints of the range we found.

```
398 \newdimen\lower@bound
399 \newdimen\upper@bound
```

(End definition for `\lower@bound` and `\upper@bound`.)

`\check@single` `\check@single` takes the size as parameter #1, size function as #2 and the size function's arguments as #3. We can assume that there is always something in the pipeline since the very last entry is a faked range (see above).

```
400 \def\check@single#1>#2<#3\@nnil{%
```

We start by assuming that we have to recurse. Note that we have to reinsert an < as it was already removed by scanning.

```
401     \def\reserved@f{\extract@rangefontinfo<#3\@nnil}%
```

Now we check the size against `\f@size`. If it is not equal `\f@size` it is no good and we have to recurse.

```
402     \ifdim \f@size \p@=#1\p@
```

Otherwise if this test is passed we can try executing the size function.

```
403      \set@simple@size@args#2<#3\@nnil
404      \execute@size@function\sizefn@info
```

If the function was successful it should have left an external font name in `\external@font`. We use this to see if we can stop scanning. Otherwise we recurse.

```
405      \ifx\external@font\@empty
406      \else
407      \let\reserved@f\@empty
408      \fi
409      \fi
410      \reserved@f}
```

*(End definition for \check@single.)*

**\set@size@funct@args** This macro sets the optional and mandatory arguments for a size function. If the optional argument is not present it is set to the empty token list. The mandatory argument is delimited by the token `\@nil`.

```
411 \def\set@size@funct@args{\@ifnextchar[%
412   \set@size@funct@args@{\set@size@funct@args@[]}}
413 \def\set@size@funct@args@[#1]#2\@nil{%
414   \def\mandatory@arg{#2}%
415   \def\optional@arg{#1}}
416 \</2ekernel>
```

*(End definition for \set@size@funct@args and \set@size@funct@args@.)*

**\DeclareSizeFunction** This function defines a new size function hiding the internal from the designer. The body of the size function may use `\optional@arg` and `\mandatory@arg` denoting the optional and mandatory argument that may follow the size specification `<...>`.

```
417 \<2ekernel>
418 \def\DeclareSizeFunction#1#2{\@namedef{s@fct@#1}{#2}}
419 \@onlypreamble\DeclareSizeFunction
420 \</2ekernel>
```

*(End definition for \DeclareSizeFunction.)*

**\execute@size@function** This macro is very simple. The only point worth noting is that calling an undefined size function will do nothing (actually execute a `\relax`).

```
421 \<2ekernel | package>
422 \def\execute@size@function#1{%
423   \<trace>
424     \ifundefined{s@fct@#1}%
425       {\errmessage{Undefined font size function #1}%
426        \s@fct@}%
427     {\csname s@fct@#1\endcsname}%
428   \</trace>
429   \<-trace> \csname s@fct@#1\endcsname
430 }
431 \</2ekernel | package>
```

*(End definition for \execute@size@function.)*

`\try@size@range` This macro tries to find a suitable range for requested size (specified by `\f@size`) in `\font@info`. All the relevant action is done in `\extract@rangefontinfo`. All that needs to be done is to stuff in the token list in `\font@info` so that `\extract@rangefontinfo` can inspect it. Note the `<-*\@nil>` token at the end to stop scanning.

```

432 {*2ekernel}
433 \def\try@size@range{%
434     \expandafter\extract@rangefontinfo\font@info <-*\@nil<\@nnil
435 }

```

*(End definition for \try@size@range.)*

`\try@size@substitution` This is the last thing that can be tried. If the desired `\f@size` is found neither among the simple size specifications nor in one of the ranges the whole list of size specifications is searched for a nearby simple size.

```

436 \gdef\try@size@substitution{%

```

First we do some initializations. `\@tempdimb` will hold the difference between the wanted size and the best solution found so far, so we initialise it with `\maxdimen`. The macro `\best@size` will hold the best size found, nothing found is indicated by the empty value.

```

437     \@tempdimb \maxdimen
438     \let \best@size \empty

```

Now we loop over the specification

```

439     \expandafter \try@simples \font@info <\number\@M>\@nil<\@nnil
440 }

```

*(End definition for \try@size@substitution.)*

`\font@submax` The macro `\font@submax` records the maximal deviation from the desired size encountered so far. Its value is used in a warning message at `\end{document}`. The macro `\fontsubfuzz` contains the amount that will not cause terminal warnings (warnings still go into the transcript file).

```

441 \def\font@submax{0pt}
442 \def\fontsubfuzz{.4pt}
443 {/2ekernel}
444 {+package}\def\fontsubfuzz{0pt}

```

*(End definition for \font@submax and \fontsubfuzz.)*

`\try@simples` `\try@simples` goes through a font shape definition in the input until it recognizes the tokens `<*\@nil>`. It looks for simple sizes to determine the two closest sizes. It is assumed that simple sizes are in increasing order.

```

445 {*2ekernel}
446 \gdef\try@simples#1<#2>{%
447     \tryif@simple#2->\tryif@simple}

```

*(End definition for \try@simples.)*

`\tryis@simple` `\tryis@simple` is similar to `\is@range`. If it sees a simple size, it checks it against the value of `\f@size` and sets `\lower@font@size` or `\higher@font@size`. In the latter case, it stops the iteration. By adding `<\number\@M>` at the end of the line we always have an end point. This is a hack which probably should be corrected.

First it checks whether it is finished already, then whether the size specification in question is a simple one.

```

448 \gdef\tryif@simple#1-#2\tryif@simple{%

```

Most common case for `\reserved@f` first:

```
449 \let \reserved@f \try@simples
450 \if>#2%
```

If so, it compares it to the value of `\f@size`. This is done using a `dimen` register since there may be fractional numbers.

```
451 \dimen@ #1\p@
452 \ifdim \dimen@<\M\p@
```

If `\dimen@` is `\M\p@` we have reached the end of the fontspec (hopefully) otherwise we compare the value with `\f@size` and compute in `\@tempdimc` the absolute value of the difference between the two values.

```
453 \ifdim \f@size\p@<\dimen@
454 \@tempdimc \dimen@
455 \advance\@tempdimc -\f@size\p@
456 \else
457 \@tempdimc \f@size\p@
458 \advance\@tempdimc -\dimen@
459 \fi
```

The result is then compared with the smallest difference we have encountered, if the new value (in `\@tempdimc` is smaller) we have found a size which is a better approximation so we make it the `\best@size` and adjust `\@tempdimb`.

```
460 \ifdim \@tempdimc<\@tempdimb
461 \@tempdimb \@tempdimc
462 \def \best@size{#1}%
463 \fi
```

When we have reached the end of the fontspec we substitute the best size found (if any). We code this inline to save macro space; in the past this was done by a macro called `\subst@size`.

```
464 \else
```

This macro substitutes the size recorded in `\best@size` for the unavailable size `\f@size`. `\subst@size` `\font@submax` records the maximum difference between desired size and selected size in the whole run.

```
465 % \subst@size %% coded inline
466 % \def\subst@size{%
467 \ifx \external@font\@empty
468 \ifx \best@size\@empty
469 \else
470 \ifdim \@tempdimb>\font@submax \relax
471 \xdef \font@submax {\the\@tempdimb}%
472 \fi
473 \let \f@user@size \f@size
474 \let \f@size \best@size
475 \ifdim \@tempdimb>\fontsubfuzz\relax
476 \@font@warning{Font\space shape\space
477 '\curr@fontshape'\space in\space size\space
478 <\f@user@size>\space not\space available\MessageBreak
479 size\space <\f@size>\space substituted}%
480 \fi
481 \try@simple@size
482 \do@subst@correction
```

```

483     \fi
484 \fi
485 % %}

```

This brings us back into the main part of `\tryif@simple`. Finally we get rid of any rubbish left over on the input stack.

```

486     \let \reserved@f \remove@to@nnil
487     \fi
488 \fi

```

If it's a range iterate also.

```

489 \reserved@f}

```

*(End definition for \tryis@simple and \subst@size.)*

## 6.1 Sizefunctions

In the following we define some useful size functions.

`\s@fct@` This is the default size function. Mandatory argument is an external font name, optional argument a scale factor. The font is scaled to `\f@size` if no optional argument is present, and to `\f@size` multiplied by the optional argument otherwise.

```

490 \DeclareSizeFunction{}\empty@sfcnt\@font@warning}
491 \DeclareSizeFunction{s}\empty@sfcnt\@font@info}
492 \def\empty@sfcnt#1{%
493     \@tempdimb \f@size\p@
494     \ifx\optional@arg\@empty
495     \else
496         \@tempdimb \optional@arg\@tempdimb
497         #1{Font\space shape\space '\curr@fontshape'\space
498             will\space be\MessageBreak
499             scaled\space to\space size\space \the\@tempdimb}%
500     \fi
501     \edef\external@font{\mandatory@arg\space at\the\@tempdimb}}

```

*(End definition for \s@fct@.)*

`\s@fct@gen` This size function generates the external name from the mandatory argument and the requested user size, and thus can be used for external names where the size is encoded in the font name. The optional argument a scale factor. The font is scaled to `\f@size` if no optional argument is present, and to `\f@size` multiplied by the optional argument otherwise.

```

502 \DeclareSizeFunction{gen}\gen@sfcnt\@font@warning}
503 \DeclareSizeFunction{sgen}\gen@sfcnt\@font@info}
504 \def\gen@sfcnt{%
505     \edef\mandatory@arg{\mandatory@arg\f@size}%
506     \empty@sfcnt}

```

*(End definition for \s@fct@gen and \s@fct@sgen.)*

`\sfct@genb` This size function is similar to `gen`, but for fonts where the size is encoded in the font name in centipoints, as in the DC fonts version 1.2. The font is scaled to `\f@size` if `\sfct@sgenb` no optional argument is present, and to `\f@size` multiplied by the optional argument otherwise.

```
507 \DeclareSizeFunction{genb}{\genb@sfcnt\@font@warning}
508 \DeclareSizeFunction{sgenb}{\genb@sfcnt\@font@info}

509 \def\genb@sfcnt{%
510     \edef\mandatory@arg{\mandatory@arg\expandafter\genb@x\f@size..\@{}}%
511     \empty@sfcnt}
```

(End definition for `\sfct@genb` and `\sfct@sgenb`.)

`\genb@x` The auxiliary macros `\genb@x` and `\genb@y` are used to convert the `\f@size` into centi-  
`\genb@y` points.

```
512 \def\genb@x#1.#2.#3\@{\two@digits{#1}\genb@y#200\@{}}
513 \def\genb@y#1#2#3\@{\#1#2}
```

(End definition for `\genb@x` and `\genb@y`.)

`\sfct@sub` This size function handles font substitution. The mandatory argument is a family/series/shape combination, the optional argument (if present) is ignored. The font encoding scheme cannot be changed. Therefore, the first thing we do is to prepend the encoding scheme.

```
514 \DeclareSizeFunction{sub}{\sub@sfcnt\@font@warning}
515 \DeclareSizeFunction{ssub}{\sub@sfcnt\@font@info}

516 \def\sub@sfcnt#1{%
517     \edef\mandatory@arg{\f@encoding/\mandatory@arg}%
```

Next action is split the arg into its individual components and allow for a late font shape load.

```
518     \begingroup
519     \expandafter\split@name\mandatory@arg/\@nil
520     \try@load@fontshape
521     \endgroup
```

Then we record the current `\f@size` since it may get clobbered.

```
522     \let\f@user@size\f@size
```

Then we check whether this new combination is defined and give an error message if not. In this case we also switch to `\error@fontshape`.

```
523     \expandafter
524     \ifx\csname\mandatory@arg\endcsname\relax
525         \errmessage{No\space declaration\space for\space
526             shape\space \mandatory@arg}%
527     \error@fontshape
528     \else
```

Otherwise we warn the user about the substitution taking place.

```
529         #1{Font\space shape\space '\curr@fontshape'\space in\space
530             size\space <\f@size>\space not\space available\MessageBreak
531             Font\space shape\space '\mandatory@arg'\space tried\space
532             instead}%
533     \expandafter\split@name\mandatory@arg/\@nil
534     \fi
```



Then we restart the font specification scan by calling `\get@external@font`.

```
535 \edef\f@size{\f@user@size}%
536 \get@external@font
```

Finally `\do@subst@correction` is called to get the font name right.

```
537 \do@subst@correction
538 }
```

*(End definition for \s@fct@sub.)*

`\@font@aliasinfo` Sometimes a substitution is only done to map a long font name to a standard shape or series, e.g.,

```
DeclareFontShape{T1}{Roboto-LF}{b}{it}{<-> alias * Roboto-LF/bold/it}{}
```

Using the `ssub` function in that case will give a strange (and incorrect) warning. As an alternative we therefore offer the size function `alias`. It will still add some info into the `.log` file, but no longer complains that the font shape is not available. It is implemented by grabbing the default warning text and replacing it with a new one.

```
539 </2ekernel>
540 <*2ekernel | latexrelease>
541 <latexrelease>\IncludeInRelease{2020/02/02}%
542 <latexrelease>{\@font@aliasinfo}{alias size function}%
543 \DeclareSizeFunction{alias}{\sub@sfcnt\@font@aliasinfo}
544 \def\@font@aliasinfo#1{%
545 \@font@info{Font\space shape\space '\curr@fontshape'\space
546 aliased\space to\MessageBreak '\mandatory@arg'}%
547 }
548 </2ekernel | latexrelease>
549 <latexrelease>\EndIncludeInRelease
550 <latexrelease>\IncludeInRelease{0000/00/00}%
551 <latexrelease>{\@font@aliasinfo}{alias size function}%
552 <latexrelease>\let\s@fct@alias\@undefined
553 <latexrelease>\let\@font@aliasinfo\@undefined
554 <latexrelease>
555 <latexrelease>\EndIncludeInRelease
556 <*2ekernel>
```

*(End definition for \@font@aliasinfo.)*

`\s@fct@subf` The `subf` size function allows substitution of another font. The mandatory argument is the external name of the font to be substituted, the optional argument a size scaling factor like in the default size function. The main difference to the default size function is the warning message.

```
557 \DeclareSizeFunction{subf}{\sub@sfcnt\@font@warning}
558 \DeclareSizeFunction{ssubf}{\sub@sfcnt\@font@info}

559 \def\sub@sfcnt#1{%
560 #1{Font\space shape\space '\curr@fontshape'\space in\space
561 size\space \f@size\space not\space available\MessageBreak
562 external\space font\space '\mandatory@arg'\space used}%
563 \empty@sfcnt#1%
564 }
```

*(End definition for \s@fct@subf.)*

`\s@fct@fixed` The `fixed` size function is for using a font at a different size than requested. A warning message is printed, and the external font to be used is taken from the mandatory argument. If an optional argument is present it is used as the ‘at’ size for the font. Otherwise the font is loaded at its design size.

```

565 \DeclareSizeFunction{fixed}{\fixed@sfcnt\@font@warning}
566 \DeclareSizeFunction{sfixed}{\fixed@sfcnt\@font@info}

567 \def\fixed@sfcnt#1{%
568   \ifx\optional@arg\@empty
569     \let\external@font\mandatory@arg
570   \else
571     \edef\external@font{\mandatory@arg\space at\optional@arg pt}%
572   \fi
573   #1{External\space font\space ‘\external@font’\space loaded\space
574     for\space size\MessageBreak
575     <\f@size>}%
576 }
577 \</2ekernel>

```

*(End definition for \s@fct@fixed.)*

# File y

## ltfsscmp.dtx

This file contains the implementation of commands giving compatibility with the original ‘NFSS1’ release of the Font Selection Scheme.

**Warning:** The macro documentation is still basically the documentation from the first NFSS release and therefore in some cases probably not completely accurate.

Version 1 of NFSS is obsolete now for about 20 years (and was “current” only for a short intermediate time) so with the 2015 release these internal interface commands are removed from the kernel and made available via `latexrelease` package so that backward compatibility remains ensured for very old documents.

```

1  \<latexrelease>
2  \IncludeInRelease{2015/01/01}{\new@fontshape}%
3                                     {NFSS version1 commands}%
4  \let\new@fontshape\@undefined
5  \let\warn@rel@i\@undefined
6  \let\scan@fontshape\@undefined
7  \let\scan@@fontshape\@undefined
8  \let\subst@fontshape\@undefined
9  \let\extra@def\@undefined
10 \let\default@mextra\@undefined
11 \let\preload@sizes\@undefined
12 \let\err@rel@i\@undefined
13 \let\newmathalphabet\@undefined
14 \let\newmathalphabet@\@undefined
15 \let\newmathalphabet@@@\@undefined
16 \let\if@no@font@opt\@undefined
17 \let\@no@font@optfalse\@undefined
18 \let\define@mathalphabet\@undefined
19 \let\define@mathgroup\@undefined
20 \let\addtoversion\@undefined
21 \EndIncludeInRelease

```

In older releases we provide the original definitions.

```

22 \IncludeInRelease{0000/00/00}{\new@fontshape}%
23                                     {NFSS version1 commands}%

```

`\new@fontshape` The interface is now `\DeclareFontShape`.

```

24 \gdef\new@fontshape#1#2#3#4{%
25     \warn@rel@i\new@fontshape\DeclareFontShape
26     \expandafter\scan@fontshape\@gobble#4<\@nil><<%
27     \DeclareFontShape U{#1}{#2}{#3}\reserved@f}%
28 \@onlypreamble\new@fontshape

```

*(End definition for \new@fontshape.)*

`\warn@rel@i` The warning message used above.

```

29 \gdef\warn@rel@i#1#2{%
30     \@font@warning{*** NFSS release 1 command

```

```

31          \noexpand#1found\MessageBreak
32      *** Update by using release 2 command
33          \string#2.\MessageBreak
34      *** Recovery is probably possible}%
35 }%
36  \@onlypreamble\warn@rel@i

```

(End definition for \warn@rel@i.)

\scan@fontshape This will scan the old font shape definition syntax.

```

37  \gdef\scan@fontshape{%
38      \let\reserved@f\@empty
39      \let\reserved@e\@empty %           holds last info
40      \scan@@fontshape
41  }%
42  \@onlypreamble\scan@fontshape

```

(End definition for \scan@fontshape.)

\scan@@fontshape

```

43  \gdef\scan@@fontshape#1>#2#3<{%
44      \ifx\@nil#1%
45          \edef\reserved@f{\reserved@f\reserved@e}%
46      \else
47          \def\reserved@b{#1}%           nick names
48          \def\reserved@c{#3}%
49          \in@{ at}{#3}%
50          \ifin@
51              \in@{pt}{#3}% not a proof but a good chance
52          \ifin@

```

We grab also everything after pt and discard it if people have forgotten to place a percent sign there.

```

53      \def\reserved@a##1 at##2pt##3\@nil{%
54          \def\reserved@b{##2}%
55          \def\reserved@c{##1}%
56      }%
57      \reserved@a#3\@nil
58      \fi
59      \fi
60      \ifnum 0<0#2
61          \edef\reserved@d{subf*\reserved@c}%
62          \ifcase #2\or
63              \or
64              \else
65                  \errmessage{*** What's this? NFSS release 0? ***}%
66              \fi
67          \else
68              \edef\reserved@d{#2\reserved@c}%
69          \fi
70          \ifx\reserved@d\reserved@e
71              \edef\reserved@f{\reserved@f<\reserved@b>}%
72          \else
73              \edef\reserved@f{\reserved@f\reserved@e<\reserved@b>}%add old info
74              \let\reserved@e\reserved@d

```

```

75     \fi
76     \expandafter\scan@@fontshape
77     \fi
78 }%
79 \@onlypreamble\scan@@fontshape

```

(End definition for \scan@@fontshape.)

\subst@fontshape This is now also handled by the extend syntax of \DeclareFontShape.

```

80 \gdef\subst@fontshape#1#2#3#4#5#6{%
81     \warn@rel@i\subst@fontshape\DeclareFontShape
82     \DeclareFontShape{U}{#1}{#2}{#3}{<->sub*#4/#5/#6}{}}%
83 \@onlypreamble\subst@fontshape

```

(End definition for \subst@fontshape.)

\extra@def This was replaced by \DeclareFontFamily.

```

84 \gdef\extra@def#1#2#3{%
85     \warn@rel@i\extra@def\DeclareFontFamily
86     \DeclareFontFamily{U}{#1}{}%
87 }%
88 \@onlypreamble\extra@def

```

(End definition for \extra@def.)

\default@mextra The new name is \DeclareFontEncodingDefaults but in this case we don't feel comfortable with this either.

```

89 \gdef\default@mextra{%
90     \warn@rel@i\default@mextra\DeclareFontEncodingDefaults

```

We pick up the argument to \default@mextra implicitly as the second argument of \DeclareFontEncodingDefaults.

```

91     \DeclareFontEncodingDefaults\relax
92 }%
93 \@onlypreamble\default@mextra

```

(End definition for \default@mextra.)

\preload@sizes The new interface is \DeclarePreloadSizes.

```

94 \gdef\preload@sizes{%
95     \warn@rel@i\preload@sizes\DeclarePreloadSizes
96     \DeclarePreloadSizes U%
97 }%
98 \@onlypreamble\preload@sizes

```

(End definition for \preload@sizes.)

\err@rel@i This macro is used in cases where emulation with NFSS2 features is not really possible.

```

99 \gdef\err@rel@i#1#2{%
100     \@latex@error{*** NFSS release 1 command \noexpand#1found%
101         ^^J*** Recovery not possible. Use \string#2}%
102     {The new release of NFSS doesn't support the
103     \noexpand#1command^^Jany longer.
104     Please upgrade your file to the syntax of NFSS
105     release 2^^Jusing the \noexpand#2command.}%

```

Let's die.

```
106 \batchmode\input.\relax
107 }%
108 \@onlypreamble\err@rel@i
```

(End definition for \err@rel@i.)

```
\newmathalphabet \newmathalphabet is the old form.
\newmathalphabet@@ 109 \gdef\newmathalphabet{%
\newmathalphabet@@@ 110 \if@no@font@opt
111 \latex@error{*** NFSS release 1 command
112 \noexpand\newmathalphabet found%
113 ^^J \space*** Automatic recovery not possible.%
114 ^^J \space*** TYPE H for Help%
115 }%
116 {Please look at the file usrguide.tex for hints on
117 how to resolve this problem.}%
118 \else
119 \warn@rel@i\newmathalphabet\DeclareMathAlphabet
120 \fi
121 \@ifstar\newmathalphabet@@@
122 \newmathalphabet@@}%
123 \gdef\newmathalphabet@@#1{\DeclareMathAlphabet#1{U}{-}{-}{-}}%
124 \gdef\newmathalphabet@@@#1#2#3#4{%
125 \DeclareMathAlphabet{#1}{U}{#2}{#3}{#4}}%
126 \@onlypreamble\newmathalphabet
127 \@onlypreamble\newmathalphabet@@
128 \@onlypreamble\newmathalphabet@@@
```

(End definition for \newmathalphabet, \newmathalphabet@@, and \newmathalphabet@@@.)

```
\if@no@font@opt
\@no@font@optfalse 129 \global\let\if@no@font@opt\iftrue
130 \gdef\@no@font@optfalse{\let\if@no@font@opt\iffalse}%
131
```

(End definition for \if@no@font@opt and \@no@font@optfalse.)

```
\define@mathalphabet This is a case where dying is best.
131 \gdef\define@mathalphabet{%
132 \err@rel@i\define@mathalphabet\DeclareMathAlphabet
133 }%
134 \@onlypreamble\define@mathalphabet
```

(End definition for \define@mathalphabet.)

```
\define@mathgroup And here is another one
135 \gdef\define@mathgroup{%
136 \err@rel@i\define@mathgroup\DeclareSymbolFont
137 }%
138 \@onlypreamble\define@mathgroup
```

(End definition for \define@mathgroup.)

```

\addtoversion \addtoversion is the old form.

139 \def\addtoversion#1#2{%
140   \warn@rel@i\addtoversion\SetMathAlphabet
141   \SetMathAlphabet#2{#1}{U}}%
142 \@onlypreamble\addtoversion

(End definition for \addtoversion.)
    Finishing off this huge \IncludeInRelease argument:
143 \EndIncludeInRelease
144 </latexrelease>

```

## File z

# ltfssdcl.dtx

This file contains the main implementation of the font selection scheme commands. See other parts of the L<sup>A</sup>T<sub>E</sub>X distribution, or *The L<sup>A</sup>T<sub>E</sub>X Companion* for higher level documentation of these commands.

**Warning:** The macro documentation is still basically the documentation from the first NFSS release and therefore in some cases probably not completely accurate.

## 1 Interface Commands

`\in@` `\@in` is a utility macro with two arguments. It determines whether its first argument occurs in its second and sets the switch `\ifin@` accordingly. The first argument may not contain braces nor # (more precisely, tokens of category code 1, 2, or 6).

```
1 <*2ekernel>
2 \def\in@#1#2%
3 {%
4   \begingroup
5     \def\in@@##1#1{%
6       \toks@{\expandafter{\in@@#2{}}#1}%
7       \edef\in@@{\the\toks@}%
8       \expandafter\endgroup
9       \ifx\in@@\@empty
10        \in@false
11      \else
12        \in@true
13      \fi
14    }
15 \newif\ifin@
```

(End definition for `\in@` and `\ifin@`.)

Before the `\begin{document}` command several *math versions* and *math alphabet identifiers* may be declared. In principle, there should be exactly one family/series/shape combination be declared for each version/alphabet pair. But we want to allow for defaults as well for automagical filling of holes.

While building the tables for math alphabet identifiers and math versions we keep several lists:

- the list of all math versions, `\version@list`, each entry prefixed by the control sequence `\version@elt`, i.e. this list has the following form

```
\version@elt<version1>\version@elt<version2>...
\version@elt<versionn>
```

- the list of all math alphabet identifiers. Here every entry has the form:

```
\group@elt<math group number>
{\{<default family>\}{<default series>\}{<default shape>\}}.
```



- Each defined math alphabet identifier holds a list containing Information about the *versions* for which it is defined. This list has a more complicated structure: it looks as follows:

```

\set@alpha<the alphabet identifier itself>
\reserved@c<math version><font info>
...
\@nil

```

where *<font info>* is either `\reserved@e` (if the combination is not defined yet) or

```
{\family}{\series}{\shape}}
```

`\version@list` We initialize the version list to be empty.

```

16 \let\version@list=\@empty
17 \@onlypreamble\version@list

```

(End definition for `\version@list`.)

`\version@elt`

```

18 \let\version@elt\relax
19 \@onlypreamble\version@elt

```

(End definition for `\version@elt`.)

`\new@mathversion` The macro `\new@mathversion` is called with the version control sequence as its argument.

```

20 %\def\new@mathversion#1{%

```

The first thing this macro does is to check if the version identifier is already present in `\version@list`. We enclose `\version@list` in braces since it might be empty (if no *version* is defined yet). But this means that we need a suitable number of `\expandafter` primitives.

```

21 % \expandafter\in@\expandafter#1\expandafter{\version@list}%
22 % \ifin@

```

If so it prints an error message. The `\next` macro is used to get rid of the four characters `\mv@` that would otherwise appear at the begin of the version name in the error message.

```

23 % \latex@error{Math version
24 % '\expandafter\@gobblefour\string#1'
25 % already defined}\@eha

```

Otherwise we have a new version, and we can proceed with entering it into the tables. We add it to `\version@list`. This is very easy: we define `\version@elt` (which is the delimiter in `\version@list`) to protect itself and the following token from being expanded and simply redefine `\version@list`.

```

26 % \else
27 % \global\expandafter\newcount\csname c@\expandafter
28 % \gobble\string#1\endcsname
29 % \global\csname c@\expandafter
30 % \gobble\string#1\endcsname\@ne
31 % \def\version@elt{\noexpand\version@elt\noexpand}%
32 % \edef\version@list{\version@list\version@elt#1}%

```

Then we prepare to enter the new version into all math alphabet identifier lists. Remember that these lists use `\reserved@c` as delimiter, and that there appears the control sequence `\reserved@e` that must not be expanded. Therefore we take suitable precautions.

```
33 %      \def\reserved@c{\noexpand\reserved@c\noexpand}%
34 %      \let\reserved@e\relax
```

We will now go through the `\alpha@list` to process every *math alphabet identifier* in turn. Since this list has `\group@elt` as a delimiter we define this control sequence. It has three arguments as every entry consists of three items (as explained above).

```
35 %      \def\group@elt##1##2##3{%
```

The first of these arguments is the *math alphabet identifier*. We redefine it by appending the information about the new version at the end of the list contained in it. However, there is one subtlety: the definitions for `\reserved@c` and `\reserved@e` made above prevent the main part of the list from being expanded. But we still have to take care of the header and the trailer. To do this we remove the trailer by means of the macro `\remove@nil` which also protect the header from being expanded. Its definition is given below. Now we can prepare to add the new version.

```
36 %          \edef##1{\expandafter\remove@nil##1%
37 %              \reserved@c
38 %              #1%
39 %              \reserved@e
40 %              \noexpand\@nil}}%
```

Finally we call `\alpha@list` which will now execute the macro `\group@elt` once for every defined *math alphabet identifier*. And that's all for now.

```
41 %      \alpha@list
42 %  \fi}
```

(End definition for `\new@mathversion`.)

`\alpha@list` As we explained above every entry in `\alpha@list` has the form  
`\alpha@elt`  
*alphabet identifier**internal group number**default font assignments*...  
We initialize it to `\@empty`.

```
43 \let\alpha@list\@empty
44 \@onlypreamble\alpha@list
```

(End definition for `\alpha@list`.)

`\alpha@elt`

```
45 \let\alpha@elt\relax
46 \@onlypreamble\alpha@elt
```

(End definition for `\alpha@elt`.)

`\newgroup` Start the group (fam) allocation at 0. (Doesn't belong here.)

```
47 \count18=-1
```

(End definition for `\newgroup`.)

`\stepcounter`

(End definition for `\stepcounter`.)

`\select@group` We surround `\select@group` with braces so that functions using it can be used directly after `_` or `^`. However, if we use oldstyle syntax where the math alphabet doesn't have arguments (ie if `\math@bgroup` is not `\bgroup`) we need to get rid of the extra group.

```

48 </2ekernel>
49 <latexrelease>\IncludeInRelease{2015/01/01}
50 <latexrelease>          {\select@group}{\select@group}%
51 <*2ekernel | latexrelease>
52 \def\select@group#1#2#3#4{%
53   \ifx\math@bgroup\bgroup\else\relax\expandafter\@firstofone\fi
54   {%
55     \ifmmode
56       \ifnum\csname c@mv@\math@version\endcsname<\e@mathgroup@top
57         \begingroup
58           \escapechar\m@ne
59           \getanddefine@fonts{\csname c@mv@\math@version\endcsname}#3%
60           \globaldefs\@ne \math@fonts
61         \endgroup
62         \init@restore@version
63         \xdef#1{\noexpand\use@mathgroup\noexpand#2%
64           {\number\csname c@mv@\math@version\endcsname}}}%
65         \global\advance\csname c@mv@\math@version\endcsname\@ne
66       \else
67         \let#1\relax
68         \@latex@error{Too many math alphabets used in
69           version \math@version}%
70         \@eha
71       \fi
72     \else \expandafter\non@alpherr\fi
73     #1{#4}%
74   }%
75 }
76 </2ekernel | latexrelease>
77 <latexrelease>\EndIncludeInRelease
78 <latexrelease>\IncludeInRelease{0000/00/00}
79 <latexrelease>          {\select@group}{\select@group}%
80 <latexrelease>\def\select@group#1#2#3#4{%
81 <latexrelease> \ifx\math@bgroup\bgroup\else\relax\expandafter\@firstofone\fi
82 <latexrelease> {%
83 <latexrelease> \ifmmode
84 <latexrelease>   \ifnum\csname c@mv@\math@version\endcsname<\sixt@@n
85 <latexrelease>     \begingroup
86 <latexrelease>       \escapechar\m@ne
87 <latexrelease>       \getanddefine@fonts
88 <latexrelease>         {\csname c@mv@\math@version\endcsname}#3%
89 <latexrelease>       \globaldefs\@ne \math@fonts
90 <latexrelease>     \endgroup
91 <latexrelease>     \init@restore@version
92 <latexrelease>     \xdef#1{\noexpand\use@mathgroup\noexpand#2%
93 <latexrelease>       {\number\csname c@mv@\math@version\endcsname}}}%
94 <latexrelease>     \global\advance\csname c@mv@\math@version\endcsname\@ne
95 <latexrelease>   \else
96 <latexrelease>     \let#1\relax
97 <latexrelease>     \@latex@error{Too many math alphabets used in
98 <latexrelease>       version \math@version}%

```

```

99 <latexrelease>      \@eha
100 <latexrelease>      \fi
101 <latexrelease> \else \expandafter\non@alpherr\fi
102 <latexrelease> #1{#4}%
103 <latexrelease> }%
104 <latexrelease>}
105 <latexrelease>\EndIncludeInRelease
106 <*2ekernel>
107 \@onlypreamble\restore@mathversion

```

(End definition for \select@group.)

\init@restore@version

```

108 \def\init@restore@version{%
109     \global\let\init@restore@version\relax
110     \xdef\restore@mathversion
111         {\expandafter\noexpand\csname mv@\math@version\endcsname
112          \global\csname c@mv@\math@version\endcsname
113          \number\csname c@mv@\math@version\endcsname\relax}%
114     \aftergroup\dorestore@version
115 }
116 \@onlypreamble\init@restore@version

```

(End definition for \init@restore@version.)

\non@alpherr

```

117 \gdef\non@alpherr#1{\@latex@error{%

```

The command here will have a space at the end of its name, so we make sure not to insert an extra one.

```

118     \string#1allowed only in math mode}\@ehd}

```

(End definition for \non@alpherr.)

\dorestore@version

```

119 \def\dorestore@version
120 {\ifmmode
121     \aftergroup\dorestore@version
122 \else
123     \gdef\init@restore@version{%
124         \global\let\init@restore@version\relax
125         \xdef\restore@mathversion
126             {\expandafter\noexpand\csname mv@\math@version\endcsname
127              \global\csname c@mv@\math@version\endcsname
128              \number\csname c@mv@\math@version\endcsname\relax}%
129         \aftergroup\dorestore@version
130     }%
131     \begingroup
132         \let\getanddefine@fonts@gobbletwo
133         \restore@mathversion
134     \endgroup
135     \fi}%
136 \@onlypreamble\dorestore@version

```

(End definition for \dorestore@version.)

`\c@localalphabets` To avoid hitting the “no more math fams available” limit of 16, we keep a defined number of math alphabets flexible/local. If we have to allocate any of those we roll back the allocation after the formula has ended, so the next formula can use other alphabets in the slot(s). This makes the processing a bit slower if you are working at the limit, but that is better than dying with “out of memory”.

```

137 </2ekernel>
138 <latexrelease>\IncludeInRelease{2021/11/15}
139 <latexrelease> {\document@select@group}{\document@select@group}%
140 <*2ekernel | latexrelease>

```

We don’t really undo the declaration on rollback (as that would be hard to maintain), so rolling forward needs to check if the declaration was already made.

```

141 \ifx\c@localmathalphabets\@undefined

```

There is no need to have this counter as part of the include checkpoints, given that it makes little sense to alter its settings mid document. All we want is the ability to change it using the `\setcounter` interface.

By default we keep two math fams flexible.

```

142 \newcount\c@localmathalphabets
143 \setcounter{localmathalphabets}{2}
144 \fi

```

*(End definition for \c@localalphabets.)*

`\document@select@group` The `\document@select@group` command is the version of `\select@group` (inside math versions) that is used in the document body to set up math alphabets (if used).

```

145 \def\document@select@group#1#2#3#4{%
146 \ifx\math@bgroup\bgroup\else\relax\expandafter\@firstofone\fi
147 {%
148 \ifmmode

```

We first check if there is still room for allocating another mathgroup. If there is, we check if it can be globally allocated or if we have reached the limit which is given by `\e@mathgroup@top` with `\c@localmathalphabets` subtracted.

```

149 \ifnum\csname c@mv@\math@version\endcsname<\e@mathgroup@top
150 \ifnum \numexpr\e@mathgroup@top-\c@localmathalphabets
151 >\csname c@mv@\math@version\endcsname
152 \else

```

If we are past this point we freeze the current state of the math version so that we can return to it after the formula has ended. Of course, that should be done only once, so we check if `\mv@<version>@frozen` already exists.

```

153 \ifcsname mv@\math@version @frozen\endcsname \else

```

We have to pass the current value of `\math@version` not the macro itself, because some of the processing is delayed to a point where the value may have changed again—not doing this caused a puzzling error in one setup.

```

154 \expandafter\freeze@math@version\expandafter{\math@version}%
155 \fi
156 \fi
157 \begingroup
158 \escapechar\m@ne
159 \getanddefine@fonts{\csname c@mv@\math@version\endcsname}#3%
160 \globaldefs\@ne \math@fonts

```

```

161 \endgroup
162 \expandafter\extract@alph@from@version
163 \csname mv@\math@version\expandafter\endcsname
164 \expandafter{\number\csname
165 c@mv@\math@version\endcsname}%
166 #1%
167 \global\advance\csname c@mv@\math@version\endcsname\@ne
168 \else
169 \let#1\relax
170 \@latex@error{Too many math alphabets used in
171 version \math@version}%
172 \@eha
173 \fi

```

Extra `\expandafter` to remove the `\expandafter` added below

```

174 \else \expandafter\expandafter\expandafter\non@alpherr\fi

```

We surround `\select@group` with braces so that functions using it can be used directly after `_` or `^`.

If the legacy interface is used, e.g., `\sf -1` the math alphabet `#1` does not take an argument so we better do not surround `#4` with braces, because then we get `{\relax}` into the formula and introduce an extra Ord atom. The two different cases can be distinguished by looking at the current value of `\math@bgroup`.

```

175 \expandafter#1\ifx\math@bgroup\bgroup{#4}\else#4\fi
176 }%
177 }

```

`\freeze@math@version` This command stores the current state of the math version and sets things up to return to it after each formula from now on. We use L3 programming layer code to set it up.

```

178 \ExplSyntaxOn
179 \cs_new_protected:Npn\freeze@math@version #1 {
Save the current \mv@<version> code and the number of allocated mathgroups inside.
180 \@font@info{Freeze~ math~ alphabet~ allocation~ in~ version~
181 #1.\MessageBreak
182 Allocated~math~groups:~\int_use:c{ c@mv@ #1 }~
183 (local:~ \int_use:N\c@localmathalphabets) }
184 \cs_gset_eq:cc { mv@#1@frozen }{ mv@#1 }
185 \tl_gset:cx { g__nfss_frozen_mv_ #1 _tl }{ \int_use:c { c@mv@#1 } }

```

Doing the reset the first time, we wait until we are out of math mode, so we use some recursive `\group_insert_after:N` for this before we execute `\mv@<version>@reset`.

```

186 \group_insert_after:N \__nfss_init_mv_freeze:N \exp_after:wN
187 \group_insert_after:N \cs:w mv@#1@reset \cs_end:

```

The `\check@mathfonts` is called at the very beginning of each math formula, so it is a good way to hook in the resetting. Again that has to happen after the formula has ended, but we know because of the place where `\check@mathfonts` is used that a single `\aftergroup` is sufficient.

```

188 \tl_gput_right:No \check@mathfonts
189 {
190 \exp_after:wN \group_insert_after:N \cs:w mv@#1@reset \cs_end:
191 }

```

Here is the definition of `\mv@<version>@reset`. If there has been no new math alphabet allocation, doing a reset would just cause a lot of unnecessary processing, so we do a quick check upfront for this.

```

192 \cs_gset:cpn{mv@#1@reset}
193 {
194     \int_compare:nNnTF { \int_use:c{c@mv@#1} } >
195         { \tl_use:c{g__nfss_frozen_mv_ #1 _tl} }
196     {
197         \@font@info{Undo~ math~ alphabet~ allocation~ in~ version~ #1}

```

If the undo is necessary, we restore the `\mv@<version>` code.

```

198         \cs_gset_eq:cc { mv@#1 }{ mv@#1@frozen }
199         \int_gset:cn { c@mv@#1 }{ \tl_use:c {g__nfss_frozen_mv_ #1 _tl} }

```

But we also should undo changes to the math alphabet definitions. We therefore run this code with a modified definition for `\getanddefine@fonts` because there is no need to do anything to the symbol fonts that are permanently allocated.

```

200         \group_begin:
201         \cs_set_eq:NN \getanddefine@fonts \use_none:n
202         \use:c {mv@#1}
203         \group_end:
204     }
205 {

```

If there was no change, we report that in the log (but this branch could go completely).

```

206         \@font@info{No~ math~ alphabet~ change~ to~ frozen~ version~ #1}
207     }
208 }
209 }

```

`\__nfss_init_mv_freeze:N`

To do the initial freeze in a safe place, we check if we are in math mode and if so try again after the group has ended by pushing the command and its single token argument with two `\group_insert_after:Ns` after the current group. If we are no longer in math mode we bypass the conditional and so the next token is our argument which is then finally executed.

```

210 \cs_new_protected:Npn \__nfss_init_mv_freeze:N #1 {%
211     \mode_if_math:T { \group_insert_after:N \__nfss_init_mv_freeze:N
212         \group_insert_after:N } #1
213 }

214 \ExplSyntaxOff

215 </2ekernel | latexrelease>
216 <latexrelease>\EndIncludeInRelease
217 <latexrelease>\IncludeInRelease{2020/10/01}
218 <latexrelease> { \document@select@group }{ \document@select@group }%
219 <latexrelease>
220 <latexrelease>\def\document@select@group#1#2#3#4{%
221 <latexrelease> \ifx\math@bgroup\bgroup\else\relax\expandafter\@firstofone\fi
222 <latexrelease> {%
223 <latexrelease> \ifmmode
224 <latexrelease> \ifnum\csname c@mv@\math@version\endcsname<\e@mathgroup@top
225 <latexrelease> \begingroup
226 <latexrelease> \escapechar\m@ne
227 <latexrelease> \getanddefine@fonts{\csname c@mv@\math@version\endcsname}#3%

```

```

228 <latexrelease> \globaldefs\@ne \math@fonts
229 <latexrelease> \endgroup
230 <latexrelease> \expandafter\extract@alph@from@version
231 <latexrelease> \csname mv@\math@version\expandafter\endcsname
232 <latexrelease> \expandafter{\number\csname
233 <latexrelease> c@mv@\math@version\endcsname}%
234 <latexrelease> #1%
235 <latexrelease> \global\advance\csname c@mv@\math@version\endcsname\@ne
236 <latexrelease> \else
237 <latexrelease> \let#1\relax
238 <latexrelease> \@latex@error{Too many math alphabets used
239 <latexrelease> in version \math@version}%
240 <latexrelease> \@eha
241 <latexrelease> \fi
242 <latexrelease> \else \expandafter\expandafter\expandafter\non@alpherr\fi
243 <latexrelease> \expandafter#1\ifx\math@bgroup\bgroup{#4}\else#4\fi
244 <latexrelease> }%
245 <latexrelease> }
246 <latexrelease> \EndIncludeInRelease
247 <latexrelease> \IncludeInRelease{2015/01/01}
248 <latexrelease> {\document@select@group}{\document@select@group}%
249 <latexrelease>
250 <latexrelease> \def\document@select@group#1#2#3#4{%
251 <latexrelease> \ifx\math@bgroup\bgroup\else\relax\expandafter\@firstofone\fi
252 <latexrelease> {%
253 <latexrelease> \ifmmode
254 <latexrelease> \ifnum\csname c@mv@\math@version\endcsname<\e@mathgroup@top
255 <latexrelease> \begingroup
256 <latexrelease> \escapechar\m@ne
257 <latexrelease> \getanddefine@fonts{\csname c@mv@\math@version\endcsname}#3%
258 <latexrelease> \globaldefs\@ne \math@fonts
259 <latexrelease> \endgroup
260 <latexrelease> \expandafter\extract@alph@from@version
261 <latexrelease> \csname mv@\math@version\expandafter\endcsname
262 <latexrelease> \expandafter{\number\csname
263 <latexrelease> c@mv@\math@version\endcsname}%
264 <latexrelease> #1%
265 <latexrelease> \global\advance\csname c@mv@\math@version\endcsname\@ne
266 <latexrelease> \else
267 <latexrelease> \let#1\relax
268 <latexrelease> \@latex@error{Too many math alphabets used
269 <latexrelease> in version \math@version}%
270 <latexrelease> \@eha
271 <latexrelease> \fi
272 <latexrelease> \else \expandafter\non@alpherr\fi
273 <latexrelease> #1{#4}%
274 <latexrelease> }%
275 <latexrelease> }
276 <latexrelease> \EndIncludeInRelease
277 <latexrelease>
278 <latexrelease> \IncludeInRelease{0000/00/00}
279 <latexrelease> {\document@select@group}{\document@select@group}%
280 <latexrelease>
281 <latexrelease> \def\document@select@group#1#2#3#4{%

```



```

282 <latexrelease> \ifx\math@bgroup\bgroup\else\relax\expandafter\@firstofone\fi
283 <latexrelease> {%
284 <latexrelease> \ifmmode
285 <latexrelease> \ifnum\csname c@mv@\math@version\endcsname<\sist@n
286 <latexrelease> \begingroup
287 <latexrelease> \escapechar\m@ne
288 <latexrelease> \getanddefine@fonts
289 <latexrelease> {\csname c@mv@\math@version\endcsname}#3%
290 <latexrelease> \globaldefs\@ne \math@fonts
291 <latexrelease> \endgroup
292 <latexrelease> \expandafter\extract@alph@from@version
293 <latexrelease> \csname mv@\math@version\expandafter\endcsname
294 <latexrelease> \expandafter{\number\csname
295 <latexrelease> c@mv@\math@version\endcsname}%
296 <latexrelease> #1%
297 <latexrelease> \global\advance\csname c@mv@\math@version\endcsname\@ne
298 <latexrelease> \else
299 <latexrelease> \let#1\relax
300 <latexrelease> \@latex@error{Too many math alphabets used
301 <latexrelease> in version \math@version}%
302 <latexrelease> \@eha
303 <latexrelease> \fi
304 <latexrelease> \else \expandafter\non@alpherr\fi
305 <latexrelease> #1{#4}%
306 <latexrelease> }%
307 <latexrelease> }
308 <latexrelease> \EndIncludeInRelease
309 <*2ekernel>

```

(End definition for \document@select@group, \freeze@math@version, and  
 \\_nfss\\_init\_mv\\_freeze:N.)

\process@table

```

310 \def\process@table{%
311   \def\cdp@elt##1##2##3##4{%
312     \@font@info{Checking defaults for
313       ##1/##2/##3/##4}%
314     \expandafter
315     \ifx\csname##1/##2/##3/##4\endcsname\relax

```

Grouping is important for two reasons, first \cdp@elt will get redefined if \Declare... functions are executed within the external .fd file and secondly \try@load@fontshape changes a lot of catcodes without surrounding itself with a group.

```

316     \begingroup
317     \def\f@encoding{##1}\def\f@family{##2}%
318     \try@load@fontshape
319     \endgroup
320   \fi
321   \expandafter
322   \ifx\csname##1/##2/##3/##4\endcsname\relax
323     \@latex@error{This NFSS system isn't set up properly}%
324     {For encoding scheme ##1 the defaults
325       ##2/##3/##4 do not form a valid font shape}%
326   \else
327     \@font@info{... okay}%

```

```

328     \fi}%
329     \cdp@list
Now we make sure that \error@fontshape is okay.
330     \begingroup
331     \escapechar\m@ne
332     \error@fontshape
333     \expandafter\ifx\csname \curr@fontshape\endcsname\relax
334     \begingroup
335     \try@load@fontshape
336     \endgroup
337     \fi
338     \expandafter\ifx\csname \curr@fontshape\endcsname\relax
339     \@latex@error{This NFSS system isn't set up properly}%
340     {The system maintainer forgot to specify a suitable
341     substitution
342     font shape using the \noexpand\DeclareErrorFont
343     command}%
344     \fi
345     \endgroup

```

Set \select@group to its meaning used within the document body.

```

346     \let\select@group\document@select@group

```

Install the default font attributes as they are currently pointing to error font face. We can speed up the process by just using \edef, thereby avoiding all kind of extra processing. Don't use \reset@font since that would trigger \selectfont.

```

347     \fontencoding\encodingdefault
348     \edef\f@family{\familydefault}%
349     \edef\f@series{\seriesdefault}%
350     \edef\f@shape{\shapedefault}%

```

Drop stuff not longer needed. We need to add many more!!!!

```

351     \everyjob{}%
352 }
353 \@onlypreamble\process@table
(End definition for \process@table.)
354 %\@onlypreamble\set@mathradical

```

\DeclareMathVersion

```

355 </2kernel>
356 <*2kernel | latexrelease>
357 <latexrelease>\IncludeInRelease{2021/11/15}%
358 <latexrelease>          {\DeclareMathVersion}{local alphabets}%
359 \def\DeclareMathVersion#1{%

```

When declaring a new math version we need to instantiate an L3 variable that is used when we freeze the version, because too many alphabets got allocated. If we don't do this, L3 programming layer complains if it is run in checking mode.

```

360     \@namedef{g__nfss_frozen_mv_#1_tl}{}%
361     \expandafter\new@mathversion\csname mv@#1\endcsname}
362     \@onlypreamble\DeclareMathVersion
363 </2kernel | latexrelease>
364 <latexrelease>\EndIncludeInRelease

```

```

365 <latexrelease>\IncludeInRelease{0000/00/00}%
366 <latexrelease>{\DeclareMathVersion}{local alphabets}%
367 <latexrelease>\def\DeclareMathVersion#1{%
368 <latexrelease> \expandafter\new@mathversion\csname mv@#1\endcsname}
369 <latexrelease>\EndIncludeInRelease
370 <*2ekernel>

```

(End definition for \DeclareMathVersion.)

\new@mathversion

```

371 \def\new@mathversion#1{%
372 \expandafter\in@\expandafter#1\expandafter{\version@list}%
373 \ifin@
374 \font@info{Redeclaring math version
375 \expandafter\@gobblefour\string#1'}%
376 \else
377 \expandafter\newcount\csname c@\expandafter
378 \gobble\string#1\endcsname
379 \def\version@elt{\noexpand\version@elt\noexpand}%
380 \edef\version@list{\version@list\version@elt#1}%
381 \fi

```

\toks@ is used to gather all tokens for the math version. \count@ will be used to count the math groups we add to this version.

```

382 \toks@{}%
383 \count@\z@

```

Now we loop over \group@list to add all math groups defined so far to the version and at the same time to count them.

```

384 \def\group@elt##1##2{%
385 \advance\count@\@ne
386 \addto@hook\toks@{\getanddefine@fonts##1##2}%
387 }%
388 \group@list

```

We set the counter for this math version to the number of math groups found in \group@list.

```

389 \global\csname c@\expandafter\gobble\string#1\endcsname\count@

```

Now we loop over \alpha@list to add all math alphabets known so far. We have to distinguish the case that an alphabet by default should produce an error in new versions.

```

390 \def\alpha@elt##1##2##3{%
391 \ifx##2\no@alphabet@error
392 \toks@\expandafter{\the\toks@\install@mathalphabet##1%
393 {\no@alphabet@error##1}}%
394 \else
395 \toks@\expandafter{\the\toks@\install@mathalphabet##1%
396 {\select@group##1##2##3}}%
397 \fi
398 }%
399 \alpha@list

```

Finally we define the math version to expand to the contents of \toks@.

```

400 \xdef#1{\the\toks@}%
401 }
402 \@onlypreamble\new@mathversion

```

(End definition for \new@mathversion.)

\DeclareSymbolFont

```

403 \def\DeclareSymbolFont#1#2#3#4#5{%
404   \@tempswafalse
405   \edef\reserved@b{#2}%
406   \def\cdp@elt##1##2##3##4{\def\reserved@c{##1}%
407     \ifx\reserved@b\reserved@c \@tempswatrue\fi}%
408   \cdp@list
409   \if@tempswa
410     \ifundefined{sym#1}{%
411       \ifnum\count18<15 %
412         \expandafter\new@mathgroup\csname sym#1\endcsname
413         \expandafter\new@symbolfont\csname sym#1\endcsname
414           {#2}{#3}{#4}{#5}%
415       \else
416         \@latex@error{Too many symbol fonts declared}\@eha
417       \fi
418     }%
419   {%
420     \@font@info{Redeclaring symbol font ‘#1’}%

```

Update the group list.

```

421   \def\group@elt##1##2{%
422     \noexpand\group@elt\noexpand##1%
423     \expandafter\ifx\csname sym#1\endcsname##1%
424       \expandafter\noexpand\csname#2/#3/#4/#5\endcsname
425     \else
426       \noexpand##2%
427     \fi}%
428   \xdef\group@list{\group@list}%

```

Update the version list.

```

429   \def\version@elt##1{%
430     \expandafter
431     \SetSymbolFont@expandafter##1\csname#2/#3/#4/#5\endcsname
432     \endcsname \csname sym#1\endcsname
433   }%
434   \version@list
435 }%
436 \else
437   \@latex@error{Encoding scheme ‘#2’ unknown}\@eha
438 \fi
439 }
440 \@onlypreamble\DeclareSymbolFont

```

(End definition for \DeclareSymbolFont.)

\group@list

```

441 \let\group@list\@empty
442 \@onlypreamble\group@list

```

(End definition for \group@list.)

```

\group@elt
443 \let\group@elt\relax
444 \@onlypreamble\group@elt

(End definition for \group@elt.)

\new@symbolfont
445 \def\new@symbolfont#1#2#3#4#5{%
446   \toks@\expandafter{\group@list}%
447   \edef\group@list{\the\toks@\noexpand\group@elt\noexpand#1%
448     \expandafter\noexpand\csname#2/#3/#4/#5\endcsname}%
449   \def\version@elt##1{\toks@\expandafter{##1}%
450     \edef##1{\the\toks@\noexpand\getanddefine@fonts
451       #1\expandafter\noexpand\csname#2/#3/#4/#5\endcsname}%
452     \global\advance\csname c@\expandafter
453       \@gobble\string##1\endcsname\@ne
454     }%
455     \version@list
456   }
457   \@onlypreamble\new@symbolfont

(End definition for \new@symbolfont.)

\SetSymbolFont
458 \def\SetSymbolFont#1#2#3#4#5#6{%
459   \@tempswafalse
460   \edef\reserved@b{#3}%
461   \def\cdp@elt##1##2##3##4{\def\reserved@c{##1}%
462     \ifx\reserved@b\reserved@c \@tempswatrue\fi}%
463   \cdp@list
464   \if@tempswa
465     \expandafter\SetSymbolFont@
466     \csname mv@#2\expandafter\endcsname\csname#3/#4/#5/#6\expandafter
467     \endcsname \csname sym#1\endcsname
468   \else
469     \@latex@error{Encoding scheme ‘#3’ unknown}\@eha
470   \fi
471 }
472 \@onlypreamble\SetSymbolFont

(End definition for \SetSymbolFont.)

\SetSymbolFont@
473 \def\SetSymbolFont@#1#2#3{%
474   \expandafter\in@\expandafter#1\expandafter{\version@list}%
475   \ifin@
476     \expandafter\in@\expandafter#3\expandafter{\group@list}%
477     \ifin@
478       \begingroup
479       \expandafter\get@cdp\string#2\@nil\reserved@a
480       \toks@{}%
481       \def\install@mathalphabet##1##2{%
482         \addto@hook\toks@{\install@mathalphabet##1{##2}}%
483       }%

```

```

484 \def\getanddefine@fonts##1##2{%
485 \ifnum##1=#3%
486 \addto@hook\toks@{\getanddefine@fonts#3#2}%
487 \expandafter\get@cdp\string##2\@nil\reserved@b
488 \ifx\reserved@a\reserved@b\else
489 \@font@info{Encoding '\reserved@b' has changed
490 to '\reserved@a' for symbol font\MessageBreak
491 '\expandafter\@gobblefour\string#3' in the
492 math version '\expandafter
493 \@gobblefour\string#1'}%
494 \fi
495 \@font@info{%
496 Overwriting symbol font
497 '\expandafter\@gobblefour\string#3' in
498 version '\expandafter
499 \@gobblefour\string#1'\MessageBreak
500 \@spaces \expandafter\@gobble\string##2 -->
501 \expandafter\@gobble\string#2}%
502 \else
503 \addto@hook\toks@{\getanddefine@fonts##1##2}%
504 \fi}%
505 #1%
506 \xdef#1{\the\toks@}%
507 \endgroup
508 \else
509 \@latex@error{Symbol font '\expandafter\@gobblefour\string#3'
510 not defined}\@eha
511 \fi
512 \else
513 \@latex@error{Math version '\expandafter\@gobblefour\string#1'
514 is not
515 defined}{You probably misspelled the name of the math
516 version.^^JOr you have to specify an additional package.}%
517 \fi
518 }
519 \@onlypreamble\SetSymbolFont@

```

(End definition for \SetSymbolFont@.)

\get@cdp

```

520 \def\get@cdp#1#2/#3\@nil#4{\def#4{#2}}
521 \@onlypreamble\get@cdp

```

(End definition for \get@cdp.)

\DeclareMathAlphabet

```

522 \def\DeclareMathAlphabet#1#2#3#4#5{%
523 \@tempswafalse
524 \edef\reserved@b{#2}%
525 \def\cdp@elt##1##2##3##4{\def\reserved@c{##1}%
526 \ifx\reserved@b\reserved@c \@tempswatrue\fi}%
527 \cdp@list
528 \if@tempswa
529 \expandafter\ifx
530 \csname\expandafter\@gobble\string#1\endcsname

```

```

531 \relax
532 \new@mathalphabet#1{#2}{#3}{#4}{#5}%
533 \else

```

Check if it is already a math alphabet.

```

534 \edef\reserved@a{\noexpand\in@{\string\select@group}%
535 {\expandafter\meaning\csname \expandafter
536 \gobble\string#1\space\endcsname}}%
537 \reserved@a
538 \ifin@
539 \@font@info{Redeclaring math alphabet \string#1}%
540 \def\version@elt##1{%
541 \expandafter\SetMathAlphabet@\expandafter
542 ##1\csname#2/#3/#4/#5\expandafter\endcsname
543 \csname M@#2\expandafter\endcsname
544 \csname \expandafter@gobble\string#1\space\endcsname#1}%
545 \version@list
546 \else

```

Check if it is a math alphabet defined via `\DeclareSymbolFontAlphabet`.

```

547 \edef\reserved@a{\noexpand\in@{\string\use@mathgroup}%
548 {\expandafter\meaning\csname \expandafter
549 \gobble\string#1\space\endcsname}}%
550 \reserved@a
551 \ifin@

```

In that case overwriting is simple since there is nothing inserted in the math version macros.

```

552 \@font@info{Redeclaring math alphabet \string#1}%
553 \new@mathalphabet#1{#2}{#3}{#4}{#5}%

```

Otherwise panic.

```

554 \else
555 \@latex@error{Command ‘\string#1’ already defined}\@eha
556 \fi
557 \fi
558 \fi
559 \else
560 \@latex@error{Encoding scheme ‘#2’ unknown}\@eha
561 \fi
562 }
563 \@onlypreamble\DeclareMathAlphabet

```

*(End definition for `\DeclareMathAlphabet`.)*

`\new@mathalphabet`

```

564 \def\new@mathalphabet#1#2#3#4#5{%
565 \toks@{\expandafter{\alpha@list}}%
566 \edef#1{\expandafter\noexpand\csname \expandafter
567 \gobble\string#1\space\endcsname
568 \if/#5/%
569 \noexpand\no@alphabet@error
570 \noexpand\no@alphabet@error
571 \else
572 \expandafter\noexpand\csname M@#2\endcsname

```

```

573         \expandafter\noexpand\csname#2/#3/#4/#5\endcsname
574     \fi
575 }%
576 \toks2\expandafter{#1}%
577 \edef\alpha@list{\the\toks@\noexpand\alpha@elt\the\toks2}%
578 \def\version@elt##1{\toks@\expandafter{##1}%
579     \edef##1{\the\toks@\install@mathalphabet
580         \expandafter\noexpand
581         \csname \expandafter@gobble
582         \string#1\space\endcsname
583     {\if/#5/%
584         \noexpand\no@alphabet@error
585         \noexpand#1%
586     \else
587         \noexpand\select@group\the\toks2
588     \fi}}%
589 }%
590 \version@list
591 \expandafter\edef\csname \expandafter@gobble
592     \string#1\space\endcsname{\if/#5/%
593     \noexpand\no@alphabet@error
594     \noexpand#1%
595 \else
596     \noexpand\select@group\the\toks2
597 \fi}%
598 \edef#1{\noexpand\protect
599     \expandafter\noexpand\csname \expandafter
600     \@gobble\string#1\space\endcsname}%
601 }
602 \@onlypreamble\new@mathalphabet

```

(End definition for \new@mathalphabet.)

\SetMathAlphabet

```

603 \def\SetMathAlphabet#1#2#3#4#5#6{%
604     \@tempswafalse
605     \edef\reserved@b{#3}%
606     \def\cdp@elt##1##2##3##4{\def\reserved@c{##1}%
607         \ifx\reserved@b\reserved@c \@tempswatrue\fi}%
608     \cdp@list
609     \if@tempswa
610         \expandafter\SetMathAlphabet@
611         \csname mv@#2\expandafter\endcsname\csname#3/#4/#5/#6\expandafter
612         \endcsname \csname M@#3\expandafter\endcsname
613         \csname \expandafter@gobble\string#1\space\endcsname#1%
614     \else
615         \@latex@error{Encoding scheme ‘#3’ unknown}\@eha
616     \fi
617 }
618 \@onlypreamble\SetMathAlphabet

```

(End definition for \SetMathAlphabet.)

\SetMathAlphabet@



```

619 \def\SetMathAlphabet@#1#2#3#4#5{%
620   \expandafter\in@\expandafter#1\expandafter{\version@list}%
621   \ifin@
622     \expandafter\in@\expandafter#4\expandafter{\alpha@list}%
623     \ifin@
624       \begingroup
625       \toks@{%
626         \def\getanddefine@fonts##1##2{%
627           \addto@hook\toks@{\getanddefine@fonts##1##2}%
628         }%
629         \def\reserved@c##1##2##3##4{%           % for message below
630           \expandafter\@gobble\string##4}%
631         \def\install@mathalphabet##1##2{%
632           \ifx##1#4%
633             \addto@hook\toks@
634               {\install@mathalphabet#4{\select@group#4#3#2}}%
635             \@font@info{Overwriting math alphabet
636               '\string#5' in version '\expandafter
637               \@gobblefour\string#1'\MessageBreak
638               \@spaces \reserved@c##2 -->
639               \expandafter\@gobble\string#2}%
640           \else
641             \addto@hook\toks@{\install@mathalphabet##1{##2}}%
642           \fi
643         }%
644         #1%
645         \xdef#1{\the\toks@}%
646       \endgroup
647     \else

```

If the math alphabet was defined via `\DeclareSymbolFontAlphabet` we have remove its external definition and add it as a normal math alphabet to every version before trying to change it in one version.

```

648   \edef\reserved@a{%
649     \noexpand\in@{\string\use@mathgroup}{\meaning#4}}%
650   \reserved@a
651   \ifin@
652     \def\reserved@b##1\use@mathgroup##2##3{%
653       \def\reserved@b{##3}\def\reserved@c{##2}}%
654     \expandafter\reserved@b#4%
655     \begingroup
656     \def\install@mathalphabet##1##2{%
657       \addto@hook\toks@{\install@mathalphabet##1{##2}}%
658     }%
659     \def\getanddefine@fonts##1##2{%
660       \addto@hook\toks@{\getanddefine@fonts##1##2}%
661       \ifnum##1=\reserved@b
662         \expandafter
663           \addto@hook\expandafter\toks@
664           \expandafter{\expandafter\install@mathalphabet
665             \expandafter#4\expandafter
666               {\expandafter\select@group\expandafter
667                 #4\reserved@c##2}}%
668       \fi

```

```

669         }%
670         \def\version@elt##1{%
671             \toks@{}%
672             ##1%
673             \xdef##1{\the\toks@}%
674         }%
675         \version@list
676     \endgroup

```

Put it into the `\alpha@list` with default ‘error’

```

677         \expandafter\gdef\expandafter\alpha@list\expandafter
678             {\alpha@list
679             \alpha@elt #4\no@alphabet@error \no@alphabet@error}%
680         \gdef#4{\no@alphabet@error #5}% fake things :-)

```

Then call the internal setting routine again:

```

681         \SetMathAlphabet@{#1}{#2}{#3}#4#5%
682     \else
683         \latex@error{Command ‘\string#5’ not defined as a
684             math alphabet}%
685         {Use \noexpand\DeclareMathAlphabet to define it.}%
686     \fi
687 \fi
688 \else
689     \latex@error{Math version ‘\expandafter\@gobblefour\string#1’
690         is not
691         defined}{You probably misspelled the name of the math
692         version.^^JOr you have to specify an additional package.}%
693 \fi
694 }
695 \onlypreamble\SetMathAlphabet@

```

(End definition for `\SetMathAlphabet@`.)

`\DeclareMathAccent` Could do with more checks like allowing single number in #4 lowercase in #4 etc

```

696 </2ekernel>
697 <*2ekernel | latexrelease>
698 <latexrelease>\IncludeInRelease{2019/10/01}%
699 <latexrelease>{DeclareMathAccent}{Make math accents robust}%
700 \def\DeclareMathAccent#1#2#3#4{%
701     \expandafter\in@<csname sym#3\expandafter\endcsname
702     \expandafter{\group@list}%
703     \ifin@
704     \begingroup
705         \count\z@=#4\relax
706         \count\tw@\count\z@
707         \divide\count\z@\sist@@n
708         \count@\count\z@
709         \multiply\count@\sist@@n
710         \advance\count\tw@-\count@
711         \if\relax\noexpand#1% is command?
712             \edef\reserved@a{\noexpand\in@
713                 {\expandafter\@gobble\string\mathaccent}
714                 {\expandafter\meaning
715                 \csname\expandafter\@gobble\string#1\space\endcsname}}%

```

```

716 \reserved@a
717 \ifin@
718 \expandafter\let
719 \csname\expandafter\@gobble\string#1\space\endcsname
720 \undefined
721 \expandafter\set@mathaccent
722 \csname sym#3\endcsname#1#2%
723 {\hexnumber@{\count\z@}\hexnumber@{\count\tw@}}%
724 \@font@info{Redeclaring math accent \string#1}%
725 \else
726 \expandafter\ifx
727 \csname\expandafter\@gobble\string#1\endcsname
728 \relax
729 \expandafter\set@mathaccent
730 \csname sym#3\endcsname#1#2%
731 {\hexnumber@{\count\z@}\hexnumber@{\count\tw@}}%
732 \else
733 \@latex@error{Command '\string#1' already defined}\@eha
734 \fi
735 \fi
736 \else
737 \@latex@error{Not a command name: '\noexpand#1'}\@eha
738 \fi
739 \endgroup
740 \else
741 \@latex@error{Symbol font '#3' is not defined}\@eha
742 \fi
743 }
744 </2ekernel | latexrelease>
745 <latexrelease>\EndIncludeInRelease
746 <latexrelease>\IncludeInRelease{0000/00/00}%
747 <latexrelease> {DeclareMathAccent}{Make math accents robust}%
748 <latexrelease>\def\DeclareMathAccent#1#2#3#4{%
749 <latexrelease> \expandafter\in@\csname sym#3\expandafter\endcsname
750 <latexrelease> \expandafter{\group@list}%
751 <latexrelease> \ifin@
752 <latexrelease> \begingroup
753 <latexrelease> \count\z@=#4\relax
754 <latexrelease> \count\tw@\count\z@
755 <latexrelease> \divide\count\z@\sixt@@n
756 <latexrelease> \count@\count\z@
757 <latexrelease> \multiply\count@\sixt@@n
758 <latexrelease> \advance\count\tw@-\count@
759 <latexrelease> \if\relax\noexpand#1% is command?
760 <latexrelease> \edef\reserved@a{\noexpand\in@
761 <latexrelease> {\expandafter\@gobble\string\mathaccent}{\meaning#1}}%
762 <latexrelease> \reserved@a
763 <latexrelease> \ifin@
764 <latexrelease> \expandafter\set@mathaccent
765 <latexrelease> \csname sym#3\endcsname#1#2%
766 <latexrelease> {\hexnumber@{\count\z@}\hexnumber@{\count\tw@}}%
767 <latexrelease> \@font@info{Redeclaring math accent \string#1}%
768 <latexrelease> \else
769 <latexrelease> \expandafter\ifx

```

```

770 <latexrelease>          \csname\expandafter\@gobble\string#1\endcsname
771 <latexrelease>          \relax
772 <latexrelease>          \expandafter\set@mathaccent
773 <latexrelease>          \csname sym#3\endcsname#1#2%
774 <latexrelease>          {\hexnumber@{\count\z@}\hexnumber@{\count\tw@}}%
775 <latexrelease>          \else
776 <latexrelease>          \@latex@error{Command ‘\string#1’ already defined}\@eha
777 <latexrelease>          \fi
778 <latexrelease>          \fi
779 <latexrelease>          \else
780 <latexrelease>          \@latex@error{Not a command name: ‘\noexpand#1’}\@eha
781 <latexrelease>          \fi
782 <latexrelease>          \endgroup
783 <latexrelease>          \else
784 <latexrelease>          \@latex@error{Symbol font ‘#3’ is not defined}\@eha
785 <latexrelease>          \fi
786 <latexrelease>        }
787 <latexrelease>\EndIncludeInRelease
788 <*2ekernel>

```

```

789 \@onlypreamble\DeclareMathAccent

```

(End definition for \DeclareMathAccent.)

\set@mathaccent

```

790 </2ekernel>
791 <*2ekernel | latexrelease>
792 <latexrelease>\IncludeInRelease{2019/10/01}%
793 <latexrelease>          {\set@mathaccent}{makemath accents robust}%
794 \def\set@mathaccent#1#2#3#4{%
795   \xdef#2{\mathaccent"\mathchar@type#3\hexnumber@#1#4\relax}%
796   \MakeRobust#2%
797 }
798 \@onlypreamble\set@mathaccent
799 </2ekernel | latexrelease>
800 <latexrelease>\EndIncludeInRelease
801 <latexrelease>\IncludeInRelease{0000/00/00}%
802 <latexrelease>          {\set@mathaccent}{makemath accents robust}%
803 <latexrelease>
804 <latexrelease>\def\set@mathaccent#1#2#3#4{%
805 <latexrelease>   \xdef#2{\mathaccent"\mathchar@type#3\hexnumber@#1#4\relax}}
806 <latexrelease>
807 <latexrelease>\EndIncludeInRelease
808 <*2ekernel>

```

(End definition for \set@mathaccent.)

\DeclareMathSymbol

```

809 \def\DeclareMathSymbol#1#2#3#4{%
810   \expandafter\in@\csname sym#3\expandafter\endcsname
811   \expandafter{\group@list}%
812   \ifin@
813     \begingroup
814       \count\z@=#4\relax
815       \count\tw@\count\z@

```

```

816 \divide\count\z@\sist@@n
817 \count@\count\z@
818 \multiply\count@\sist@@n
819 \advance\count\tw@-\count@
820 \if\relax\noexpand#1% is command?

```

Store the command name with a space attached inside `\reserved@@b` in case we look at a robust definition.

```

821 \edef\reserved@b{\expandafter\noexpand
822 \csname\expandafter@gobble\string#1\space\endcsname}%

```

Test both `#1` and `#1_` for containing `mathchar`.

```

823 \edef\reserved@a
824 {\noexpand\in@{\expandafter@gobble\string\mathchar}%
825 {\meaning#1\expandafter\meaning\reserved@b}}%
826 \reserved@a

```

Drop `#1_` in case it was defined before.

```

827 \global\expandafter\let\reserved@b\@undefined
828 \ifin@
829 \expandafter\set@mathsymbol
830 \csname sym#3\endcsname#1#2%
831 {\hexnumber@{\count\z@}\hexnumber@{\count\tw@}}%
832 \@font@info{Redeclaring math symbol \string#1}%
833 \else
834 \expandafter\ifx
835 \csname\expandafter@gobble\string#1\endcsname
836 \relax
837 \expandafter\set@mathsymbol
838 \csname sym#3\endcsname#1#2%
839 {\hexnumber@{\count\z@}\hexnumber@{\count\tw@}}%
840 \else
841 \@latex@error{Command '\string#1' already defined}\@eha
842 \fi
843 \fi
844 \else
845 \expandafter\set@mathchar
846 \csname sym#3\endcsname#1#2
847 {\hexnumber@{\count\z@}\hexnumber@{\count\tw@}}%
848 \fi
849 \endgroup
850 \else
851 \@latex@error{Symbol font '#3' is not defined}\@eha
852 \fi
853 }
854 \@onlypreamble\DeclareMathSymbol

```

*(End definition for \DeclareMathSymbol.)*

`\set@mathchar`

```

855 \def\set@mathchar#1#2#3#4{%
856 \global\mathcode'#2="\mathchar@type#3\hexnumber@#1#4\relax}
857 \@onlypreamble\set@mathchar

```

*(End definition for \set@mathchar.)*

`\set@mathsymbol`

```

858 \def\set@mathsymbol#1#2#3#4{%
859   \global\mathchardef#2"\mathchar@type#3\hexnumber@#1#4\relax}
860 \@onlypreamble\set@mathsymbol

(End definition for \set@mathsymbol.)

861 %\def\mathsymbol#1#2#3{%
862 %   \@tempcnta=#3\relax
863 %   \@tempcntb\@tempcnta
864 %   \divide\@tempcnta\sixt@@n
865 %   \count@\@tempcnta
866 %   \multiply\count@\sixt@@n
867 %   \advance\@tempcntb-\count@
868 %   \mathchar"\mathchar@type#1\hexnumber@#2%
869 %       \hexnumber@\@tempcnta\hexnumber@\@tempcntb\relax}
870 %
871 %\def\DeclareMathAlphabetCharacter#1#2#3{%
872 %   \DeclareMathSymbol{#1}7{#2}{#3}}

```

`\DeclareMathDelimiter`

```

873 \def\DeclareMathDelimiter#1{%
874   \if\relax\noexpand#1%
875     \expandafter\@DeclareMathDelimiter
876   \else
877     \expandafter\@xxDeclareMathDelimiter
878   \fi
879   #1}
880 \@onlypreamble\DeclareMathDelimiter

```

(End definition for `\DeclareMathDelimiter`.)

`\@xxDeclareMathDelimiter`

This macro checks if the second arg is a “math type” such as `\mathopen`. The undocumented original code didn’t use math types when the delimiter was a single letter. For this reason the coding is a bit strange as it tries to support the undocumented syntax for compatibility reasons.

```

881 \def\@xxDeclareMathDelimiter#1#2#3#4{%

```

7 is the default value returned in the case that `\mathchar@type` is passed something unexpected, like a math symbol font name. We locally move `\mathalpha` out of the way so if you use that the right branch is taken. This will still fail if an explicit number 7 is used!

```

882   \begingroup
883   \let\mathalpha\mathord
884   \ifnum7=\mathchar@type{#2}%
885   \endgroup

```

If this branch is taken we have old syntax (5 arguments).

```

886     \expandafter\@firstofone
887   \else

```

If this branch is taken `\mathchar@type` is different from 7 so we assume new syntax. In this case we also use the arguments to set up the letter as a math symbol for the case where it is not used as a delimiter.

```

888   \endgroup
889   \DeclareMathSymbol#1{#2}{#3}{#4}%

```

Then we arrange that `\@xDeclareMathDelimiter` only gets #1, #3, #4 ... as it does not expect a math type as argument.

```

890     \expandafter\@firstoftwo
891     \fi
892     {\@xDeclareMathDelimiter#1}{#2}{#3}{#4}}
893 \onlypreamble\@xxDeclareMathDelimiter

```

(End definition for `\@xxDeclareMathDelimiter`.)

`\@DeclareMathDelimiter`

```

894 \def\@DeclareMathDelimiter#1#2#3#4#5#6{%
895   \expandafter\in@\csname sym#3\expandafter\endcsname
896   \expandafter{\group@list}%
897   \ifin@
898     \expandafter\in@\csname sym#5\expandafter\endcsname
899     \expandafter{\group@list}%
900   \ifin@
901     \begingroup
902       \count\z@=#4\relax
903       \count\tw@\count\z@
904       \divide\count\z@\sist@@n
905       \count@\count\z@
906       \multiply\count@\sist@@n
907       \advance\count\tw@-\count@
908       \edef\reserved@c{\hexnumber@{\count\z@}\hexnumber@{\count\tw@}}%
909     %
910     \count\z@=#6\relax
911     \count\tw@\count\z@
912     \divide\count\z@\sist@@n
913     \count@\count\z@
914     \multiply\count@\sist@@n
915     \advance\count\tw@-\count@
916     \edef\reserved@d{\hexnumber@{\count\z@}\hexnumber@{\count\tw@}}%
917   %
918   \edef\reserved@a{\noexpand\in@
919     {\expandafter\@gobble\string\delimiter}{\meaning#1}}%
920   \reserved@a
921   \ifin@
922     \expandafter\set@mathdelimiter
923     \csname sym#3\expandafter\endcsname
924     \csname sym#5\endcsname#1#2%
925     \reserved@c\reserved@d
926     \@font@info{Redeclaring math delimiter \string#1}%
927   \else
928     \expandafter\ifx
929     \csname\expandafter\@gobble\string#1\endcsname
930     \relax
931     \expandafter\set@mathdelimiter
932     \csname sym#3\expandafter\endcsname
933     \csname sym#5\endcsname#1#2%
934     \reserved@c\reserved@d
935   \else
936     \@latex@error{Command ‘\string#1’ already defined}\@eha
937   \fi

```

```

938     \fi
939   \endgroup
940   \else
941     \@latex@error{Symbol font ‘#5’ is not defined}\@eha
942   \fi
943   \else
944     \@latex@error{Symbol font ‘#3’ is not defined}\@eha
945   \fi
946 }
947 \@onlypreamble\@DeclareMathDelimiter
(End definition for \@DeclareMathDelimiter.)

```

`\@xDeclareMathDelimiter`

```

948 \def\@xDeclareMathDelimiter#1#2#3#4#5{%
949   \expandafter\in@\csname sym#2\expandafter\endcsname
950   \expandafter{\group@list}%
951   \ifin@
952     \expandafter\in@\csname sym#4\expandafter\endcsname
953     \expandafter{\group@list}%
954   \ifin@
955     \begingroup
956       \count\z@=#3\relax
957       \count\tw@\count\z@
958       \divide\count\z@\sixt@@n
959       \count@\count\z@
960       \multiply\count@\sixt@@n
961       \advance\count\tw@-\count@
962       \edef\reserved@c{\hexnumber@{\count\z@}\hexnumber@{\count\tw@}}%
963       %
964       \count\z@=#5\relax
965       \count\tw@\count\z@
966       \divide\count\z@\sixt@@n
967       \count@\count\z@
968       \multiply\count@\sixt@@n
969       \advance\count\tw@-\count@
970       \edef\reserved@d{\hexnumber@{\count\z@}\hexnumber@{\count\tw@}}%
971       \expandafter\set@mathdelimiter
972       \csname sym#2\expandafter\endcsname\csname sym#4\endcsname#1%
973       \reserved@c\reserved@d
974     \endgroup
975   \else
976     \@latex@error{Symbol font ‘#4’ is not defined}\@eha
977   \fi
978   \else
979     \@latex@error{Symbol font ‘#2’ is not defined}\@eha
980   \fi
981 }
982 \@onlypreamble\@xDeclareMathDelimiter
(End definition for \@xDeclareMathDelimiter.)

```

`\set@mathdelimiter` We have to end the definition of a math delimiter like `\lfloor` with a space and not with `\relax` as we did before, because otherwise constructs involving `\abovewithdelims` will prematurely end (pr/1329)



```

983 </2ekernel>
984 <*2ekernel | latexrelease>
985 <latexrelease>\IncludeInRelease{2019/10/01}%
986 <latexrelease>          {\set@mathdelimiter}{make delimiters robust}%
987 \def\set@mathdelimiter#1#2#3#4#5#6{%

```

We use `\protected` not `\MakeRobust` so that `\bigl\lfloor` etc. works inside the argument of `\protected@edef`.

```

988   \protected
989   \xdef#3{\delimiter"\mathchar@type#4\hexnumber@#1#5%
990     \hexnumber@#2#6 }%
991 %   \MakeRobust#3%
992 }
993 \@onlypreamble\set@mathdelimiter
994 </2ekernel | latexrelease>
995 <latexrelease>\EndIncludeInRelease
996 <latexrelease>\IncludeInRelease{0000/00/00}%
997 <latexrelease>          {\set@mathdelimiter}{make delimiters robust}%
998 <latexrelease>
999 <latexrelease>\def\set@mathdelimiter#1#2#3#4#5#6{%
1000 <latexrelease>   \xdef#3{\delimiter"\mathchar@type#4\hexnumber@#1#5%
1001 <latexrelease>     \hexnumber@#2#6 }}
1002 <latexrelease>
1003 <latexrelease>\EndIncludeInRelease
1004 <*2ekernel>

```

*(End definition for \set@mathdelimiter.)*

`\set@@mathdelimiter`

```

1005 \def\set@@mathdelimiter#1#2#3#4#5{%
1006   \global\delcode'#3="\hexnumber@#1#4\hexnumber@#2#5\relax}
1007 \@onlypreamble\set@@mathdelimiter

```

*(End definition for \set@@mathdelimiter.)*

`\DeclareMathRadical`

```

1008 \def\DeclareMathRadical#1#2#3#4#5{%

```

Below is a crude fix to make this macro work if #1 is undefined or `\relax`. Should be improved!

```

1009   \expandafter\ifx
1010     \csname\expandafter\@gobble\string#1\endcsname
1011     \relax
1012     \let#1\radical
1013   \fi
1014   \edef\reserved@a{\noexpand\in@
1015     {\expandafter\@gobble\string\radical}{\meaning#1}}%
1016   \reserved@a
1017   \ifin@
1018     \expandafter\in@\csname sym#2\expandafter\endcsname
1019     \expandafter{\group@list}%
1020   \ifin@
1021     \expandafter\in@\csname sym#4\expandafter\endcsname
1022     \expandafter{\group@list}%
1023   \ifin@

```

```

1024 \begingroup
1025 \count\z@=#3\relax
1026 \count\tw@\count\z@
1027 \divide\count\z@\sist@@n
1028 \count@\count\z@
1029 \multiply\count@\sist@@n
1030 \advance\count\tw@-\count@
1031 \edef\reserved@c{%
1032 \hexnumber@\count\z@}\hexnumber@\count\tw@}}%
1033 \count\z@=#5\relax
1034 \count\tw@\count\z@
1035 \divide\count\z@\sist@@n
1036 \count@\count\z@
1037 \multiply\count@\sist@@n
1038 \advance\count\tw@-\count@
1039 \edef\reserved@d{%
1040 \hexnumber@\count\z@}\hexnumber@\count\tw@}}%

```

Coded inline instead of using \set@mathradical

```

1041 % \expandafter\set@mathradical
1042 % \csname sym#2\expandafter\endcsname
1043 % \csname sym#4\endcsname#1%
1044 % \reserved@c\reserved@d
1045 \xdef#1{\radical"\expandafter\hexnumber@
1046 \csname sym#2\endcsname\reserved@c
1047 \expandafter\hexnumber@
1048 \csname sym#4\endcsname\reserved@d
1049 \relax}%
1050 \endgroup
1051 \else
1052 \@latex@error{Symbol font ‘#4’ is not defined}\@eha
1053 \fi
1054 \else
1055 \@latex@error{Symbol font ‘#2’ is not defined}\@eha
1056 \fi
1057 \else
1058 \@latex@error{Command ‘\string#1’ already defined}\@eha
1059 \fi
1060 }
1061 \@onlypreamble\DeclareMathRadical

```

(End definition for \DeclareMathRadical.)

Definition below was wrong it contained \delimiter !

```

def\set@mathradical#1#2#3#4#5{%
\xdef#3{\radical"\hexnumber@#1#4\hexnumber@#2#5\relax}}

```

\mathalpha just a dummy currently

```

1062 \let\mathalpha\relax

```

(End definition for \mathalpha.)

\mathchar@type

```

1063 \def\mathchar@type#1{%
1064 \ifodd 2#11 #1\else % is this non-negative number?

```

```

1065 \ifx#1\mathord 0\else
1066 \ifx#1\mathop 1\else
1067 \ifx#1\mathbin 2\else
1068 \ifx#1\mathrel 3\else
1069 \ifx#1\mathopen 4\else
1070 \ifx#1\mathclose 5\else
1071 \ifx#1\mathpunct 6\else
1072 7% % anything else is variable ord
1073 \fi
1074 \fi
1075 \fi
1076 \fi
1077 \fi
1078 \fi
1079 \fi
1080 \fi}
1081 \@onlypreamble\mathchar@type

```

(End definition for \mathchar@type.)

\DeclareSymbolFontAlphabet

```

1082 \def\DeclareSymbolFontAlphabet#1#2{%
1083 \expandafter\DeclareSymbolFontAlphabet@
1084 \csname \expandafter\@gobble\string#1\space\endcsname{#2}#1}
1085 \@onlypreamble\DeclareSymbolFontAlphabet

```

(End definition for \DeclareSymbolFontAlphabet.)

\DeclareSymbolFontAlphabet@

```

1086 \def\DeclareSymbolFontAlphabet@#1#2#3{%
We use the switch \if@tempswa to decide if we can declare this symbol font alphabet.
1087 \@tempswatrue
First check if #2 is known to be a symbol font
1088 \expandafter\in@\csname sym#2\expandafter\endcsname
1089 \expandafter{\group@list}%
1090 \ifin@
Check if #1 is defined as a math alphabet defined via \DeclareMathAlphabet:
1091 \expandafter\in@\expandafter#1\expandafter{\alpha@list}%
1092 \ifin@
If so remove it from the \alpha@list and from all math version macros.
1093 \@font@info{Redefining math alphabet \string#3}%
1094 \toks@{}%
1095 \def\alpha@elt##1##2##3{%
1096 \ifx##1#1\else\addto@hook\toks@{\alpha@elt##1##2##3}\fi}%
1097 \alpha@list
1098 \xdef\alpha@list{\the\toks@}%
Now we loop over all versions and remove the math alphabet:
1099 \def\version@elt##1{%
1100 \begingroup
1101 \toks@{}%
1102 \def\getanddefine@fonts####1####2{%

```

```

1103         \addto@hook\toks@{\getanddefine@fonts####1####2}}%
1104         \def\install@mathalphabet####1####2{%
1105             \ifx####1#1\else
1106                 \addto@hook\toks@{\install@mathalphabet
1107                                     ####1{####2}}\fi}%
1108             ##1%
1109             \xdef##1{\the\toks@}%
1110         \endgroup
1111     }%
1112     \version@list
1113 \else

```

If #3 is not defined as a math alphabet check if it is defined at all:

```

1114     \expandafter\ifx
1115     \csname\expandafter\@gobble\string#1\space\endcsname
1116     \relax

```

If it is undefined, fine otherwise check if it is a math alphabet defined via `\DeclareSymbolFontAlphabet`:

```

1117     \else
1118         \edef\reserved@a{%
1119             \noexpand\in@{\string\use@mathgroup}{\meaning#1}}%
1120         \reserved@a
1121         \ifin@
1122             \@font@info{Redeclaring math alphabet \string#3}%
1123         \else

```

Since the command #3 is defined to be something which is not a math alphabet we have to skip redefining it.

```

1124         \@tempswafalse
1125         \@latex@error{Command ‘\string#3’ already defined}\@eha
1126     \fi
1127 \fi
1128 \fi
1129 \else

```

Since the symbol font is not known we better skip defining this alphabet.

```

1130     \@tempswafalse
1131     \@latex@error{Unknown symbol font ‘#2’}\@eha
1132 \fi
1133 \if@tempswa

```

When we reach this point we are allowed to define #1 to be a symbol font math alphabet. This means that we have to set it to

`\use@mathgroup <math-settings> \sym<name>`

The `<math-settings>` are the one for the encoding that is used in the font shape where `\sym<name>` is pointing to. This means that we have to get it from the information stored in `\group@list`. Thus we loop through that list after defining `\group@elt` in a suitable way.

```

1134     \def\group@elt##1##2{%
1135         \expandafter\ifx\csname sym#2\endcsname##1%
1136         \expandafter\reserved@a\string##2\@nil
1137         \fi}%
1138     \def\reserved@a##1##2/##3\@nil{%

```

```

1139     \def\reserved@a{##2}}}%
1140     \group@list
1141     \toks@{\relax\ifmmode \else \non@alpherr#1\fi}%
1142     \edef#1{\the\toks@
1143         \noexpand\use@mathgroup
1144         \expandafter\noexpand\csname M@\reserved@a\endcsname
1145         \csname sym#2\endcsname}%
1146     \def#3{\protect#1}%
1147     \fi
1148 }
1149 \@onlypreamble\DeclareSymbolFontAlphabet@
1150 </2ekernel>

```

*(End definition for \DeclareSymbolFontAlphabet@.)*

## File A

# ltfssini.dtx

This file contains the top level L<sup>A</sup>T<sub>E</sub>X interface to the font selection scheme commands. See other parts of the L<sup>A</sup>T<sub>E</sub>X distribution, or *The L<sup>A</sup>T<sub>E</sub>X Companion* for higher level documentation of these commands.

## 1 NFSS Initialization

Finally, there are six commands that are to be used in L<sup>A</sup>T<sub>E</sub>X and that we will therefore protect against expansion at the wrong point: `\fontfamily`, `\fontseries`, `\fontshape`, `\fontsize`, `\selectfont`, and `\mathversion`.

```
1 <*2ekernel>
```

### 1.1 Providing math *versions*

L<sup>A</sup>T<sub>E</sub>X provides two *versions*. We call them *normal* and *bold*, respectively.

```
2 \DeclareMathVersion{normal}
3 \DeclareMathVersion{bold}
```

Now we define the standard font change commands. We don't allow the use of `\rmfamily` etc. in math mode.

(Actually most are now defined further down in the file.)

First the changes to another *family*:

```
4 %\DeclareRobustCommand\rmfamily
5 %      {\not@math@alphabet\rmfamily\mathrm
6 %      \fontfamily\rmdefault\selectfont}
7 %\DeclareRobustCommand\sffamily
8 %      {\not@math@alphabet\sffamily\mathsf
9 %      \fontfamily\sfddefault\selectfont}
10 %\DeclareRobustCommand\ttfamily
11 %      {\not@math@alphabet\ttfamily\mathtt
12 %      \fontfamily\ttdefault\selectfont}
```

Then the commands changing the *series*:

```
13 %\DeclareRobustCommand\bfseries
14 %      {\not@math@alphabet\bfseries\mathbf
15 %      \fontseries\bfdefault\selectfont}
16 %\DeclareRobustCommand\mdseries
17 %      {\not@math@alphabet\mdseries\relax
18 %      \fontseries\mddefault\selectfont}
19 \DeclareRobustCommand\upshape
20      {\not@math@alphabet\upshape\relax
21      \fontshape\updefault\selectfont}
```

Then the commands changing the *shape*:

```
22 \DeclareRobustCommand\slshape
23      {\not@math@alphabet\slshape\relax
24      \fontshape\sldefault\selectfont}
25 \DeclareRobustCommand\scshape
26      {\not@math@alphabet\scshape\relax
```

```

27         \fontshape\scdefault\selectfont}
28 \DeclareRobustCommand\itshape
29     {\not@math@alphabet\itshape\mathit
30     \fontshape\itdefault\selectfont}

```

## 2 Custom series settings for main document families

This section was introduced 2020/02/02 and for now we support a full rollback (may need splitting later).

```

31 </2ekernel>
32 <*2ekernel | latexrelease>
33 <latexrelease>\IncludeInRelease{2021/11/15}%
34 <latexrelease>          {\DeclareFontSeriesDefault}{Custom series}%

```

One problem with the NFSS approach of handling the series axis turned out to be that (especially with respect to “boldness”) different font families implemented different strategies. For example, with Computer Modern fonts you normally only have **bx** whereas most PostScript fonts offered only **b** but not **bx**. As a result L<sup>A</sup>T<sub>E</sub>X’s standard setting for `\bfdefault` didn’t work with such fonts, but if it got changed to produce **b**, then that didn’t work with Computer Modern if the fonts got combined (e.g., using Computer Modern Typewriter with such fonts).

The solution back then was to provide substitution rules in the font `.fd` such that if a **bx** series got requested the **b** series got used. While this works in that particular case, it isn’t a very general solution. For example, if you happen to have a font family that has several weights you may want to typeset the whole document in a somewhat lighter or darker font but if you then modify `\mddefault` to allow for this, then of course your change only works with that particular family but not with the typewriter or sans serif family you also want to use.

A better solution was provided by the `mweights` package by Bob Tennent that offers defaults on the level of the three main font families in the document: for “rm”, “sf” and “tt” so that font packages could define defaults for the sans serif document font by providing `\bfseries@sf` which then was used when `\bfseries` got executed and the current family was the `\sffamily`.

`\DeclareFontSeriesDefault` We now support this concept directly from within L<sup>A</sup>T<sub>E</sub>X and for use in font packages (or the document preamble) we offer `\DeclareFontSeriesDefault`. This declaration takes three arguments:

**document family interface:** Can either be `rm`, `sf` or `tt`. This is optional and if not given the overall default.

**document series interface:** Can be `md` or `bf`.

**series value:** This is the value that is going to be used with the combination is requested.

For example, `\DeclareFontSeriesDefault[rm]{bf}{sb}` would use **sb** (semi-bold) when `\rmfamily \bfseries` is asked for.

If used without the optional argument, e.g., `\DeclareFontSeriesDefault{bf}{b}` then this is like redefining `\bfdefault` or `\mddefault`.

If some family specific defaults aren't given, e.g. if there are no declarations for, say, `tt` then the format defaults of `\mddefault` and `\bfdefault` are assumed. If those are later changed this is *not* reflected!<sup>28</sup>

`\DeclareFontSeriesDefault` The command to declare font series defaults for the “rm”, “sf” or “tt” family.

```

35 \let\DeclareFontSeriesDefault\undefined      % for rollback
36 \newcommand\DeclareFontSeriesDefault[3][]{%
37     \expand@font@defaults
38     \maybe@update@bfseries@defaults
39     \maybe@update@mdseries@defaults
40     \def\reserved@a{#1}%

```

No optional argument: set up general default.

```

41 \ifx\reserved@a\empty
42     \ifcsname #2series\endcsname              % supported are
43                                             % \[md/bf]default

```

Adding `\@empty` allows us to detect if the default gets redefined with `\renewcommand` or `\def` by the user.

```

44     \expandafter\def
45         \csname #2default\endcsname{#3\@empty}%
46     \expandafter\def
47         \csname #2default@previous\endcsname{#3\@empty}%
48 \else
49     \@latex@error{Wrong syntax for \string\DeclareFontSeriesDefault}%
50     {Mandatory first argument must be 'md' or 'bf'.}
51 \fi

```

Optional argument given, set up specific default.

```

52 \else
53     \ifcsname #2series@#1\endcsname          % supported are
54                                             % \[md/bf]series@[rm/sf/tt]
55     \expandafter\edef
56         \csname #2series@#1\endcsname{#3}%

```

If the interface is used we remove the frozen kernel default. This way, we know that something was explicitly set up (even if the setup has the same value as the default).

```

57     \expandafter\let
58         \csname #2series@#1@kernel\endcsname\undefined
59 \else
60     \@latex@error{Wrong syntax for \string\DeclareFontSeriesDefault}%
61     {Optional argument must be 'rm', 'sf', or 'tt'. \MessageBreak
62     Mandatory first argument must be 'md' or 'bf'.}
63 \fi
64 \fi
65 }

```

---

<sup>28</sup>I see no easy way to achieve this without compromising compatibility with existing packages that currently use `mweights` and directly define (some) of the `\mdseries@...` commands but not others.



(End definition for \DeclareFontSeriesDefault.)

```
66 </2ekernel | latexrelease>
67 <latexrelease>\EndIncludeInRelease
68 <latexrelease>\IncludeInRelease{2020/02/02}%
69 <latexrelease>          {\DeclareFontSeriesDefault}{Custom series}%
70 <latexrelease>
71 <latexrelease>\let\DeclareFontSeriesDefault\@undefined          % for rollback
72 <latexrelease>\newcommand\DeclareFontSeriesDefault[3] [] {%
73 <latexrelease>  \def\reserved@a{#1}%
74 <latexrelease>  \ifx\reserved@a\@empty
75 <latexrelease>    \ifcsname #2series\endcsname          % supported are
76 <latexrelease>                                % \[md/bf]default
77 <latexrelease>    \expandafter\def
78 <latexrelease>      \csname #2default\endcsname{#3\@empty}%
79 <latexrelease>    \expandafter\def
80 <latexrelease>      \csname #2default@previous\endcsname{#3\@empty}%
81 <latexrelease>  \else
82 <latexrelease>    \@latex@error{Wrong syntax for \string\DeclareFontSeriesDefault}%
83 <latexrelease>      {Mandatory first argument must be 'md' or 'bf'.}
84 <latexrelease>  \fi
85 <latexrelease> \else
86 <latexrelease>  \ifcsname #2series@#1\endcsname          % supported are
87 <latexrelease>                                % \[md/bf]series@[rm/sf/tt]
88 <latexrelease>    \expandafter\edef
89 <latexrelease>      \csname #2series@#1\endcsname{#3}%
90 <latexrelease>    \expandafter\let
91 <latexrelease>      \csname #2series@#1@kernel\endcsname\@undefined
92 <latexrelease>  \else
93 <latexrelease>    \@latex@error{Wrong syntax for \string\DeclareFontSeriesDefault}%
94 <latexrelease>      {Optional argument must be 'rm', 'sf', or 'tt'. \MessageBreak
95 <latexrelease>      Mandatory first argument must be 'md' or 'bf'.}
96 <latexrelease>  \fi
97 <latexrelease> \fi
98 <latexrelease>}
99 <latexrelease>
100 <latexrelease>\EndIncludeInRelease
101 <latexrelease>\IncludeInRelease{0000/00/00}%
102 <latexrelease>          {\DeclareFontSeriesDefault}{Custom series}%
103 <latexrelease>
104 <latexrelease>\let\DeclareFontSeriesDefault\@undefined
105 <latexrelease>\let\bfseries@rm\@undefined
106 <latexrelease>\let\bfseries@sf\@undefined
107 <latexrelease>\let\bfseries@tt\@undefined
108 <latexrelease>\let\bfseries@rm@kernel\@undefined
109 <latexrelease>\let\bfseries@sf@kernel\@undefined
110 <latexrelease>\let\bfseries@tt@kernel\@undefined
111 <latexrelease>\let\mdseries@rm\@undefined
112 <latexrelease>\let\mdseries@sf\@undefined
113 <latexrelease>\let\mdseries@tt\@undefined
114 <latexrelease>\expandafter\let\csname ver@weights.sty\endcsname\@undefined
115 <latexrelease>
116 <latexrelease>\let\@meta@family@list\@undefined
117 <latexrelease>\let\prepare@family@series@update\@undefined
118 <latexrelease>\let@update@series@target@value\@undefined
```

119 `<latexrelease>`

This is always called in `\document` so don't make it undefined.

120 `<latexrelease>\let\init@series@setup\relax`

121 `<latexrelease>`

122 `<latexrelease>\EndIncludeInRelease`

123 `<*2ekernel>`

124 `</2ekernel>`

125 `<*2ekernel | latexrelease>`

126 `<latexrelease>\IncludeInRelease{2020/02/02}%`

127 `<latexrelease> { \mdseries@rm } { Custom series } %`

`\mdseries@rm` We initialize the family specific default at the end of the format generation. Later on  
`\mdseries@sf` they may get overwritten in the preamble or a package via `\DeclareFontSeriesDefault`  
`\mdseries@tt` (or possibly directly).

`\bfseries@rm` Conceptual change: The `\bfdefault` will be `b` not `bx` because that is what it should  
`\bfseries@sf` be really for nearly every font except Computer/Latin Modern.

`\bfseries@tt` To account for the fact that by default we typeset in CM or LM we set up the  
`\bfseries@..` defaults to use `bx` instead.

This means that it behaves like before because if the default fonts are used then  
`\bfseries@rm` etc kick in and make `\textbf` use `bx`. However, if the font gets changed  
then `\bfdefault` will get used.

128 `\def\bfseries@rm{bx}`

129 `\def\bfseries@sf{bx}`

130 `\def\bfseries@tt{bx}`

Frozen version of the kernel defaults so we can see if they have changed.

131 `\let\bfseries@rm@kernel\bfseries@rm`

132 `\let\bfseries@sf@kernel\bfseries@sf`

133 `\let\bfseries@tt@kernel\bfseries@tt`

The default for the medium series is `m` and this will be interpreted as resetting both  
weight and width. To reset only one of them the virtual value `?m` and `m?` are available.

134 `\def\mdseries@rm{m}`

135 `\def\mdseries@sf{m}`

136 `\def\mdseries@tt{m}`

(End definition for `\mdseries@rm` and others.)

`\series@change@debug` For debugging, but right now none of this code is extracted. The idea is to have a separate  
package with debugging code one day.

137 `<*debug>`

138 `\let\series@change@debug\typeout`

139 `\let\series@change@debug\@gobble`

140 `</debug>`

(End definition for `\series@change@debug`.)

`\prepare@family@series@update` This is core command that prepares for the family update. The big difference to the  
documented code above is that the nested `\ifx` statements seem to be missing. Instead  
we loop through an internal list that holds the names of the three meta families. This  
approach allows us to extend the mechanism at a later stage to allow for additional named  
meta families.

Here is the current definition of that list:

```
\@meta@family@list
141 \def\@meta@family@list{\@elt{rm}\@elt{sf}\@elt{tt}}

142 \def\prepare@family@series@update#1#2{%

143   \if@forced@series
144   <+debug> \series@change@debug{No series preparation (forced \f@series)\on@line}%
145     \fontfamily#2%
146   \else
147   <+debug> \series@change@debug{Preparing for switching to #1 (#2)\on@line}%
148     \expand@font@defaults
```

We prepare for changing the current series. We have to find it before changing the family as discussed above.

```
149   \let\target@series@value\@empty
150   \def\target@meta@family@value{#1}%
```

As the very last item in the meta family list we add \@elt{??} and define this pseudo meta family to be the current font family. So if none of the real meta families matched then this will match. This will cover the following case:

- \bfseries is called for a family using **bx** (e.g., CMR)
- Switch to a font family that is none of the meta families, e.g., via \fontfamily{ptm}\allowbreak\
- Then none of the real meta families, match but the final \@elt{??} will.
- Therefore if the current series is \mddefault or \bfdefault it will be detected and the corresponding target series selected.

```
151   \expandafter\edef\csname ??def@ult\endcsname{\f@family}%
```

To find it we loop over the meta family list with a suitable definition of \@elt.

```
152   \let\@elt@update@series@target@value
153   \@meta@family@list
```

Last resort pseudo meta family. Will only be looked at if none of the real ones have matched.

```
154     \@elt{??}%
155     \let\@elt\relax
```

That will figure out the correct series value to use without updating it. Now we can change the family.

```
156   \fontfamily#2%
```

After that we update the series. That code is again like the one above.

```
157   \ifx\target@series@value\@empty
158   <+debug> \series@change@debug{Target series still empty ...}%
159   \else
160     \ifx \f@series\target@series@value
161   <+debug> \series@change@debug{Target series unchanged:
162   <+debug>                                     \f@series \space = \target@series@value}%
163     \else
164     \maybe@load@fontshape
165   <+debug> \series@change@debug{Target series:
166   <+debug>                                     \f@series \space -> \target@series@value}%
```

The `\target@series@value` may contain something like `cm` (coming from a default) and so we can't directly assign it to `\f@series` we have to drop any surplus `m` first.

```

167 %      \let\f@series\target@series@value
168      \series@maybe@drop@one@m\target@series@value\f@series
169      \fi
170      \fi
171 \fi
172 }

```

(End definition for `\prepare@family@series@update` and `\@meta@family@list`.)

`\update@series@target@value` In this macro used in the look you basically find the nested `\ifxs` from the outline above. The only difference is that is it is parameterized instead of being written out and only for one block of tests because the code is called repeatedly when looping over the meta family list. From the list we get each meta family name in turn.

```

173 \def\update@series@target@value#1{%

```

There is one additional test at the beginning, because the list contains all meta families and we need to ignore the case where current one from the list and target one are identical.

```

174   \def\reserved@a{#1}%
175   \ifx\target@meta@family@value\reserved@a    % rm -> rm do nothing
176   \else
177   <+debug> \series@change@debug{Trying to match #1: \csname#1def@ult\endcsname
178   <+debug>          \space = \f@family\space ?}%

```

We only “do” something if the current font family matches the current meta family.

```

179   \expandafter\ifx\csname#1def@ult\endcsname\f@family

```

If that's the case we know that this is the block that applies (only one meta family can match). So to speed things up we change `\@elt` so that the rest of the loop gets gobbled.

```

180       \let\@elt\@gobble

```

Then we try to find the right new value for the series (as explained above). The two macros defined first are only there because we now need to use `\csname` and this way the code will be a little faster.

```

181       \expandafter\let\expandafter\reserved@b
182           \csname mdseries@\target@meta@family@value\endcsname
183       \expandafter\let\expandafter\reserved@c
184           \csname bfseries@\target@meta@family@value\endcsname
185   <+debug>\series@change@debug{Targets for mdseries and bfseries:
186   <+debug>          \reserved@b\space and \reserved@c}%

```

This here is now identical to the nested `\ifx` block from the outline, except that it there appeared twice in `\rmfamily`. This is now covered by looping and stopping the loop when a match was found.

We have to sanitize the default value first because it may contain something like `mc` and that would never match `\f@series` because there it would be called `c` with the `m` dropped. It would be probably better to do that differently these days, but it is hard to adjust without causing a lot of issues, so we do the dropping in various places instead.

```

187       \expandafter\series@maybe@drop@one@m
188       \csname mdseries@#1\endcsname\reserved@d
189       \ifx\reserved@d\f@series
190   <+debug>   \series@change@debug{mdseries@#1 matched -> \reserved@b}%
191           \let\target@series@value\reserved@b
192       \else

```

Again do some sanitizing.

```

193     \expandafter\series@maybe@drop@one@m
194     \csname bfseries@#1\endcsname\reserved@d
195     \ifx\reserved@d\series
196 <+debug> \series@change@debug{bfseries@#1 matched -> \reserved@c}%
197     \let\target@series@value\reserved@c
198     \else\ifx\series\mddef@ult \let\target@series@value\reserved@b
199 <+debug> \series@change@debug{mddef@ult matched -> \reserved@b}%
200     \else\ifx\series\bfdef@ult \let\target@series@value\reserved@c
201 <+debug> \series@change@debug{bfdef@ult matched -> \reserved@c}%
202     \fi\fi\fi\fi
203     \fi
204     \fi
205 }

```

(End definition for \update@series@target@value.)

\init@series@setup This is code to be run at begin document ...

```

206 \def\init@series@setup{%

```

We only want **bx** in `\bfseries@rm` if the roman font is Computer Modern or Latin Modern, otherwise it should be **b**. It was set to **bx** in the kernel so that any font use with the default families in the preamble get this value. Now at the real document start we check if the fonts have been changed. If there was a `\DeclareFontSeriesDefault` declaration or `\bfseries@rm` was directly altered then it differs from `\bfseries@rm@kernel` and we do nothing. Otherwise we check if `\rmdefault` is one of the CM/LM font families and if so we keep **bx** otherwise we change it to **b**.

This approach doesn't cover one case: CM/LM got changed to a different family that supports **bx**, but the support package for that family used `\def\bfseries@rm{bx}` instead of using `\DeclareFontSeriesDefault`. In that case the code here changes it to **b**. Solution: use the `\DeclareFontSeriesDefault` interface.

```

207 \ifx\bfseries@rm@kernel\bfseries@rm
208     \expandafter\in@\expandafter{\rmdefault}%
209     {cmr,cmss,cmtt,lcms,lcmtt,lmr,lmss,lmtt}%
210 \ifin@ \else \def\bfseries@rm{b}\fi\fi

```

Same approach for `\bfseries@sf` and `\bfseries@tt`:

```

211 \ifx\bfseries@sf@kernel\bfseries@sf
212     \expandafter\in@\expandafter{\sfdefault}%
213     {cmr,cmss,cmtt,lcms,lcmtt,lmr,lmss,lmtt}%
214 \ifin@ \else \def\bfseries@sf{b}\fi\fi
215 \ifx\bfseries@tt@kernel\bfseries@tt
216     \expandafter\in@\expandafter{\ttdefault}%
217     {cmr,cmss,cmtt,lcms,lcmtt,lmr,lmss,lmtt}%
218 \ifin@ \else \def\bfseries@tt{b}\fi\fi

```

If the document preamble has changed the `\familydefault` or if the if the `\rmdefault` contains a new font family, we may have to adjust the series defaults accordingly, before starting typesetting.

Similarly, if the user has changed the `\mddefault` or the medium series for the family selected as document font we may also have to adjust the `\seriesdefault`.

On the other hand if the document font is still CM or LM then `\bfdefault` is wrong, because it is now saying **b** and not **bx** as it should for such fonts.

To fix all this we first run `\reset@font` (the internal kernel name for `\normalfont`). This will set up the document encoding, family, series and shape based on the current values of `\encodingdefault`, `\familydefault`, `\seriesdefault` and `\shapedefault`. However, if the family (from `\familydefault`) has special medium default we should switch to that (and not use what is current value from `\seriesdefault`). This can be achieved by afterwards calling `\mediumseries` and then changing `\seriesdefault` to the now current series value (in `\f@series`).

But what should happen if `\seriesdefault` got explicitly changed? In that case the explicit change should survive and we should not alter `\seriesdefault`. This is solved by comparing the current value of `\seriesdefault` with a kernel version saved in the format and if they differ we do not call `\mdseries` or change `\seriesdefault`.

```

219 \reset@font
220 \ifx\seriesdefault\seriesdefault@kernel
221 \mdseries
222 \let\seriesdefault\f@series
223 \fi
224 }%
```

(End definition for `\init@series@setup`.)

As the kernel code now implements the same functionality as `mweights`, albeit internally coded slightly differently, that package shouldn't be loaded any more. We therefore pretend that it already got loaded. Thus, a font package that tries to load it and then sets `\mdseries@.`, etc. will continue to work but will now use the kernel code.

Of course, mid-term such package should probably use `\DeclareFontSeriesDefault` instead of making using low-level definitions.

```

225 \expandafter\let\csname ver@mweights.sty\endcsname\fmtversion
226 </2ekernel|latexrelease>
227 <latexrelease>\EndIncludeInRelease
228 <latexrelease>\IncludeInRelease{0000/00/00}%
229 <latexrelease> \mdseries@rm}{Custom series}%
230 <latexrelease>
231 <latexrelease>\let\bfseries@rm\@undefined
232 <latexrelease>\let\bfseries@sf\@undefined
233 <latexrelease>\let\bfseries@tt\@undefined
234 <latexrelease>\let\bfseries@rm@kernel\@undefined
235 <latexrelease>\let\bfseries@sf@kernel\@undefined
236 <latexrelease>\let\bfseries@tt@kernel\@undefined
237 <latexrelease>\let\mdseries@rm\@undefined
238 <latexrelease>\let\mdseries@sf\@undefined
239 <latexrelease>\let\mdseries@tt\@undefined
240 <latexrelease>\expandafter\let\csname ver@mweights.sty\endcsname\@undefined
241 <latexrelease>
242 <latexrelease>\let\@meta@family@list\@undefined
243 <latexrelease>\let\prepare@family@series@update\@undefined
244 <latexrelease>\let\update@series@target@value\@undefined
245 <latexrelease>
```

This is always called in `\document` so don't make it undefined.

```

246 <latexrelease>\let\init@series@setup\relax
247 <latexrelease>
248 <latexrelease>\EndIncludeInRelease
249 <*2ekernel>
```

```

250 </2ekernel>
251 <*2ekernel | latexrelease>
252 <latexrelease>\IncludeInRelease{2021/11/15}%
253 <latexrelease>          {\bfseries}{Custom series with hooks}%

```

**\bfseries** This document command switches to the bold series.

```

254 \DeclareRobustCommand\bfseries{%
255   \not@math@alphabet\bfseries\mathbf

```

In the original NFSS definition it then called `\fontseries` with the value `\bfdefault`. In the new scheme we have more alternatives and therefore check if the current family (`\f@family`) is the current `\rmdef@ult`, `\sfdef@ult` or `\ttdef@ult` and then select the correct family default in that case.

```

256   \expand@font@defaults
257   \maybe@update@bfseries@defaults

258   \ifx\f@family\rmdef@ult      \fontseries\bfseries@rm
259   \else\ifx\f@family\sfdef@ult \fontseries\bfseries@sf
260   \else\ifx\f@family\ttdef@ult \fontseries\bfseries@tt

```

If not `\bfdefault` is used.

```

261   \else                      \fontseries\bfdefault
262   \fi\fi\fi

```

This hook in contrast is always executed.

```

263   \UseHook{bfseries}%
264   \selectfont
265 }

```

(End definition for `\bfseries`.)

`\maybe@update@bfseries@defaults` If `\bfdefault` and `\bfdefault@previous` are different then the default got changed directly through the legacy interface (i.e., via `\def` or `\renewcommand`). In that case we reset all meta family defaults so that the document behaves like it was the case before the new mechanism was introduced.

```

266 \def\maybe@update@bfseries@defaults{%
267   \ifx\bfdefault\bfdefault@previous\else

```

We add `\@empty` and then let `\bfdefault@previous` to `\bfdefault` so that we can detect any further change.

```

268   \expandafter\def\expandafter\bfdefault
269   \expandafter{\bfdefault\@empty}%
270   \let\bfdefault@previous\bfdefault

```

And we reset the meta family defaults (`\bfdef@ult` is an expanded version of `\bfdefault`).

```

271   \let\bfseries@rm\bfdef@ult
272   \let\bfseries@sf\bfdef@ult
273   \let\bfseries@tt\bfdef@ult

```

Formats that set up parallel fonts, e.g., for Japanese, can use this hook to add resets here. Not that this hook is only run when resets are necessary.

```

274   \UseHook{bfseries/defaults}%
275   \fi
276 }

```

(End definition for `\maybe@update@bfseries@defaults`.)

`\mdseries` This document command switches to the medium series.

```
277 \DeclareRobustCommand\mdseries{%
278   \not@math@alphabet\mdseries\relax
279   \expand@font@defaults
280   \maybe@update@mdseries@defaults
281   \ifx\f@family\rmdef@ult      \fontseries\mdseries@rm
282     \else\ifx\f@family\sfdef@ult \fontseries\mdseries@sf
283       \else\ifx\f@family\ttdef@ult \fontseries\mdseries@tt
284         \else
285           \fi\fi\fi
286       \UseHook{mdseries}%
287   \selectfont
288 }
```

(End definition for `\mdseries`.)

`\maybe@update@mdseries@defaults`

```
289 \def\maybe@update@mdseries@defaults{%
290   \ifx\mddefault\mddefault@previous\else
291     \expandafter\def\expandafter\mddefault\expandafter{\mddefault\@empty}%
292     \let\mddefault@previous\mddefault
293     \let\mdseries@rm\mddef@ult
294     \let\mdseries@sf\mddef@ult
295     \let\mdseries@tt\mddef@ult
```

Formats that set up parallel fonts, e.g., for Japanese, can use this hook to add resets here.

```
296   \UseHook{mdseries/defaults}%
297   \fi
298 }
```

(End definition for `\maybe@update@mdseries@defaults`.)

```
299 </2ekernel | latexrelease>
300 <latexrelease>\EndIncludeInRelease
301 <latexrelease>\IncludeInRelease{2020/10/01}%
302 <latexrelease>          {\bfseries}{Custom series with hooks}%
303 <latexrelease>
304 <latexrelease>\let\maybe@update@bfseries@defaults\@undefined
305 <latexrelease>\let\maybe@update@mdseries@defaults\@undefined
306 <latexrelease>
307 <latexrelease>\DeclareRobustCommand\bfseries{%
308 <latexrelease>  \not@math@alphabet\bfseries\mathbf
309 <latexrelease>  \expand@font@defaults
310 <latexrelease>  \ifx\bfdefault\bfdefault@previous\else
311 <latexrelease>    \expandafter\def\expandafter\bfdefault
312 <latexrelease>      \expandafter{\bfdefault\@empty}%
313 <latexrelease>    \let\bfdefault@previous\bfdefault
314 <latexrelease>    \let\bfseries@rm\bfdef@ult
315 <latexrelease>    \let\bfseries@sf\bfdef@ult
316 <latexrelease>    \let\bfseries@tt\bfdef@ult
317 <latexrelease>    \UseHook{bfseries/defaults}%
318 <latexrelease>  \fi
319 <latexrelease>    \ifx\f@family\rmdef@ult      \fontseries\bfseries@rm
320 <latexrelease>    \else\ifx\f@family\sfdef@ult \fontseries\bfseries@sf
```



```

321 <latexrelease> \else\ifx\f@family\ttdef@ult \fontseries\bfseries@tt
322 <latexrelease> \else \fontseries\bfdefault
323 <latexrelease> \fi\fi\fi
324 <latexrelease> \UseHook{bfseries}%
325 <latexrelease> \selectfont
326 <latexrelease>}
327 <latexrelease>
328 <latexrelease>\DeclareRobustCommand\mdseries{%
329 <latexrelease> \not@math@alphabet\mdseries\relax
330 <latexrelease> \expand@font@defaults
331 <latexrelease> \ifx\mddefault\mddefault@previous\else
332 <latexrelease> \expandafter\def\expandafter\mddefault\expandafter{\mddefault\@empty}%
333 <latexrelease> \let\mddefault@previous\mddefault
334 <latexrelease> \let\mdseries@rm\mddef@ult
335 <latexrelease> \let\mdseries@sf\mddef@ult
336 <latexrelease> \let\mdseries@tt\mddef@ult
337 <latexrelease> \UseHook{mdseries/defaults}%
338 <latexrelease> \fi
339 <latexrelease> \ifx\f@family\rmdef@ult \fontseries\mdseries@rm
340 <latexrelease> \else\ifx\f@family\sdef@ult \fontseries\mdseries@sf
341 <latexrelease> \else\ifx\f@family\ttdef@ult \fontseries\mdseries@tt
342 <latexrelease> \else \fontseries\mddefault
343 <latexrelease> \fi\fi\fi
344 <latexrelease> \UseHook{mdseries}%
345 <latexrelease> \selectfont
346 <latexrelease>}
347 <latexrelease>\EndIncludeInRelease
348 <latexrelease>\IncludeInRelease{2020/02/02}%
349 <latexrelease> {\bfseries}{Custom series with hooks}%
350 <latexrelease>
351 <latexrelease>
352 <latexrelease>\DeclareRobustCommand\bfseries{%
353 <latexrelease> \not@math@alphabet\bfseries\mathbf
354 <latexrelease> \expand@font@defaults
355 <latexrelease> \ifx\f@family\rmdef@ult \fontseries\bfseries@rm
356 <latexrelease> \else\ifx\f@family\sdef@ult \fontseries\bfseries@sf
357 <latexrelease> \else\ifx\f@family\ttdef@ult \fontseries\bfseries@tt
358 <latexrelease> \else \fontseries\bfdefault
359 <latexrelease> \fi\fi\fi
360 <latexrelease> \selectfont
361 <latexrelease>}
362 <latexrelease>
363 <latexrelease>\DeclareRobustCommand\mdseries{%
364 <latexrelease> \not@math@alphabet\mdseries\relax
365 <latexrelease> \expand@font@defaults
366 <latexrelease> \ifx\f@family\rmdef@ult \fontseries\mdseries@rm
367 <latexrelease> \else\ifx\f@family\sdef@ult \fontseries\mdseries@sf
368 <latexrelease> \else\ifx\f@family\ttdef@ult \fontseries\mdseries@tt
369 <latexrelease> \else \fontseries\mddefault
370 <latexrelease> \fi\fi\fi
371 <latexrelease> \selectfont
372 <latexrelease>}
373 <latexrelease>
374 <latexrelease>

```

```

375 <latexrelease>
376 <latexrelease>\EndIncludeInRelease
377 <latexrelease>\IncludeInRelease{0000/00/00}%
378 <latexrelease>                {\bfseries}{Custom series with hooks}%
379 <latexrelease>
380 <latexrelease>\DeclareRobustCommand\bfseries
381 <latexrelease>                {\not@math@alphabet\bfseries\mathbf}
382 <latexrelease>                \fontseries\bfdefault\selectfont}
383 <latexrelease>\DeclareRobustCommand\mdseries
384 <latexrelease>                {\not@math@alphabet\mdseries\relax
385 <latexrelease>                \fontseries\mddefault\selectfont}
386 <latexrelease>
387 <latexrelease>\EndIncludeInRelease
388 <*2ekernel>
389
390
391
392
393 </2ekernel>
394 <*2ekernel | latexrelease>
395 <latexrelease>\IncludeInRelease{2020/10/01}%
396 <latexrelease>                {\expand@font@defaults}{Custom series with hooks}%

```

`\expand@font@defaults` The family specific defaults are fully expanded, i.e., they are defined via `\edef` inside `\rm@def@ult` `\DeclareFontSeriesDefault`. However, the overall defaults, e.g., `\bfdefault` may have been redefined by the user and thus may not be fully expanded. So to enable reliable comparison we make expanded versions of them. That we rerun each time. The alternative would be to only allow for changes before begin document.

```

\rm@def@ult
\sf@def@ult
\tt@def@ult
\md@def@ult
\bf@def@ult
397 \def\expand@font@defaults{%
398   \edef\rmdef@ult{\rmdefault}%
399   \edef\sfdef@ult{\sfdefault}%
400   \edef\ttdef@ult{\ttdefault}%

```

The series defaults may contain some surplus `m` that we need to drop here.

```

401   \series@maybe@drop@one@m\bfdefault\bfdef@ult
402   \series@maybe@drop@one@m\mddefault\mddef@ult

```

Formats that set up parallel fonts, e.g., for Japanese, can use this hook to add additional code here.

```

403   \UseHook{expand@font@defaults}%
404 }

```

*(End definition for `\expand@font@defaults` and others.)*

`\rmfamily` Here are the document level commands for changing the main font families, or rather, here is a documented outline of the code, the actual code is then streamlined and somewhat generalized.

```

DeclareRobustCommand\rmfamily{%
  \not@math@alphabet\rmfamily\mathrm

```

If families are changed then we have to do a bit more work. In the original NFSS implementation a family change kept encoding, series shape and size unchanged but now we can't any longer simply reuse the current series value. Instead we may have to change it from one family default to the next.

```
\expand@font@defaults
```

We have to do the testing while the current family is still unchanged but we have to do the adjustment of the series after it got changed (because the new family might have different sets of shapes available and we certainly don't want to see substitution going on. So we use `\target@series@value` to hold the target series (if any).

```
\let\target@series@value\@empty
```

Thus, if the current family is the sans family

```
\ifx\f@family\sfdef@ult
```

and if we using the medium series of the sans family

```
\ifx\f@series\mdseries@sf
```

then lets switch to the medium series for the serif family

```
\let\target@series@value\mdseries@rm
```

and if we use the bold series of the sans family switch to the bold default of the serif family:

```
\else\ifx\f@series\bfseries@sf \let\target@series@value\bfseries@rm
```

However, the sans family may not have any specific defaults set, so we also compare with the overall defaults.

```
\else\ifx\f@series\mddef@ult \let\target@series@value\mdseries@rm
\else\ifx\f@series\bfdef@ult \let\target@series@value\bfseries@rm
```

If neither test was true we leave the series alone. This way a special manual setting such as `\fontseries{lc}` is not undone if the family changes (of course there may not be any support for it in the new family but then the NFSS substitution kicks in and sorts it out).

```
\fi\fi\fi\fi
```

We need to do the same if the current family is the typewriter family:

```
\else\ifx\f@family\ttdef@ult
\ifx\f@series\mdseries@tt \let\target@series@value\mdseries@rm
\else\ifx\f@series\bfseries@tt \let\target@series@value\bfseries@rm
\else\ifx\f@series\mddef@ult \let\target@series@value\mdseries@rm
\else\ifx\f@series\bfdef@ult \let\target@series@value\bfseries@rm
\fi\fi\fi\fi
\fi\fi
```

With these preparations for series out of the way we can now change the font family to `\rmdefault`.

```
\fontfamily\rmdefault
```

If `\target@series@value` is still empty there is nothing more to do other than selecting the new family. However, if not then we should update the font series now as well. But there is one further subtle issue. We may not have loaded an `.fd` file for our target font family yet. In the past that was done in `\selectfont` if necessary but since we are now doing all the comparisons in `\fontseries` we need to make sure that the font family specifications are already loaded prior to calling `\fontseries`.

```
\ifx\target@series@value\@empty \else
  \maybe@load@fontshape
```

Updating the series in this case means directly changing `\f@series` to the target value. We don't want to go through `\fontseries` because that would apply the mappings and then `\bx + b` would keep `\bx` instead of changing to `b` as desired. as

```
\let\f@series\target@series@value
\fi
\selectfont}
```

So now for the real definition: most of the code above gets delegated to a helper command `\prepare@family@series@update` so that the definition becomes again fairly short. In addition we add a hook, mainly for our Japanese friends so that the code can be extended prior to the call to `\selectfont`.

```
405 \DeclareRobustCommand\rmfamily{%
406   \not@math@alphabet\rmfamily\mathrm
```

This holds all the code discussed above, first argument is the meta family, i.e., `rm` in this case, and second argument is the default family name, e.g., `cmr` indirectly accessed via `\rmdefault`. This is calling `\fontfamily` and if necessary `\fontseries` as outline above.

```
407   \prepare@family@series@update{rm}\rmdefault
```

Then comes the hook code (by default a no-op) and finally the call to `\selectfont`.

```
408   \UseHook{rmfamily}%
409   \selectfont}
```

The definitions for `\sffamily` and `\ttfamily` are similar, the differences are only in what font families get checked.

```
\sffamily
\ttfamily
410 \DeclareRobustCommand\sffamily{%
411   \not@math@alphabet\sffamily\mathsf
412   \prepare@family@series@update{sf}\sfdefault
413   \UseHook{sffamily}%
414   \selectfont}

415 \DeclareRobustCommand\ttfamily{%
416   \not@math@alphabet\ttfamily\mathtt
417   \prepare@family@series@update{tt}\ttdefault
418   \UseHook{ttfamily}%
419   \selectfont}
```

*(End definition for `\rmfamily`, `\sffamily`, and `\ttfamily`.)*

```

rmfamily Declare the hooks used above.
sffamily 420 \NewHook{rmfamily}
ttfamily 421 \NewHook{sffamily}
normalfont 422 \NewHook{ttfamily}
expand@font@defaults 423 \NewHook{normalfont}
bfseries 424 \NewHook{expand@font@defaults}
bfseries/defaults 425 \NewHook{bfseries}
mdseries 426 \NewHook{bfseries/defaults}
mdseries/defaults 427 \NewHook{mdseries}
428 \NewHook{mdseries/defaults}

(End definition for rmfamily and others.)

\@rmfamilyhook These four hooks have legacy versions used in 2020/02/02 so we should support them
\@sffamilyhook until they aren't any longer used.
\@ttfamilyhook By default the hooks do nothing.
\@defaultfamilyhook 429 \let\@rmfamilyhook\@empty
430 \let\@sffamilyhook\@empty
431 \let\@ttfamilyhook\@empty
432 \let\@defaultfamilyhook\@empty %Fmi sort out

(End definition for \@rmfamilyhook and others.)

433 </2ekernel | latexrelease>
434 <latexrelease>\EndIncludeInRelease
435 <latexrelease>\IncludeInRelease{2020/02/02}%
436 <latexrelease> \{expand@font@defaults\}{Custom series with hooks}%
437 <latexrelease>
438 <latexrelease>\def\expand@font@defaults{%
439 <latexrelease> \edef\rmdef@ult{\rmdefault}%
440 <latexrelease> \edef\sffdef@ult{\sffdefault}%
441 <latexrelease> \edef\ttdef@ult{\ttdefault}%
442 <latexrelease> \edef\bfdef@ult{\bfdefault}%
443 <latexrelease> \edef\mddef@ult{\mddefault}%
444 <latexrelease> \edef\famdef@ult{\familydefault}%
445 <latexrelease>}
446 <latexrelease>
447 <latexrelease>
448 <latexrelease>\DeclareRobustCommand\rmfamily{%
449 <latexrelease> \not@math@alphabet\rmfamily\mathrm
450 <latexrelease> \prepare@family@series@update{rm}\rmdefault
451 <latexrelease> \@rmfamilyhook
452 <latexrelease> \selectfont}
453 <latexrelease>\DeclareRobustCommand\sffamily{%
454 <latexrelease> \not@math@alphabet\sffamily\mathsf
455 <latexrelease> \prepare@family@series@update{sf}\sffdefault
456 <latexrelease> \@sffamilyhook
457 <latexrelease> \selectfont}
458 <latexrelease>\DeclareRobustCommand\ttfamily{%
459 <latexrelease> \not@math@alphabet\ttfamily\mathtt
460 <latexrelease> \prepare@family@series@update{tt}\ttdefault
461 <latexrelease> \@ttfamilyhook
462 <latexrelease> \selectfont}
463 <latexrelease>\let\@rmfamilyhook\@empty
464 <latexrelease>\let\@sffamilyhook\@empty

```

```

465 <latexrelease>\let\@ttfamilyhook\@empty
466 <latexrelease>
467 <latexrelease>
468 <latexrelease>\EndIncludeInRelease
469 <latexrelease>\IncludeInRelease{0000/00/00}%
470 <latexrelease>                {\expand@font@defaults}{Custom series with hooks}%
471 <latexrelease>
472 <latexrelease>\let\expand@font@defaults\@undefined
473 <latexrelease>
474 <latexrelease>\DeclareRobustCommand\bfseries
475 <latexrelease>        {\not@math@alphabet\bfseries\mathbf
476 <latexrelease>        \fontseries\bfdefault\selectfont}
477 <latexrelease>\DeclareRobustCommand\mdseries
478 <latexrelease>        {\not@math@alphabet\mdseries\relax
479 <latexrelease>        \fontseries\mddefault\selectfont}
480 <latexrelease>\DeclareRobustCommand\rmfamily
481 <latexrelease>        {\not@math@alphabet\rmfamily\mathrm
482 <latexrelease>        \fontfamily\rmdefault\selectfont}
483 <latexrelease>\DeclareRobustCommand\sffamily
484 <latexrelease>        {\not@math@alphabet\sffamily\mathsf
485 <latexrelease>        \fontfamily\sfdefault\selectfont}
486 <latexrelease>\DeclareRobustCommand\ttfamily
487 <latexrelease>        {\not@math@alphabet\ttfamily\mathtt
488 <latexrelease>        \fontfamily\ttdefault\selectfont}
489 <latexrelease>
490 <latexrelease>\let\@rmfamilyhook\@undefined
491 <latexrelease>\let\@sffamilyhook\@undefined
492 <latexrelease>\let\@ttfamilyhook\@undefined
493 <latexrelease>
494 <latexrelease>\EndIncludeInRelease
495 <*2ekernel>

```

**\IfFontSeriesContextTF** With the ability for `\bfseries` or `\mdseries` to be mapped to different NFSS axis values it becomes important to have the ability to determine the current context as we can no longer look at `\f@series` to answer a question such as “am I currently typesetting in a bold typeface?”

This is provided by the test `\IfFontSeriesContextTF`. It takes three arguments:

- The context we try to check (either `bf` for bold or `md` for medium, i.e., the same that can go into the first mandatory argument of `\DeclareFontSeriesDefault`),
- what to do if we are in this context (true case) and
- what to do if we are not (false case).

This allows you to define commands like `\IfBold`, e.g.,

```
\newcommand\IfBold[2]{\IfSeriesContextTF{bf}{#1}{#2}}
```

and then do

```
This is \IfBold{bold}{non-bold} text.
```

and get the appropriate result.

```

496 \endkernel
497 \ifx\kernel\latexrelease
498 \includeinrelease{2020/10/01}%
499 \ifx\kernel\latexrelease\IfFontSeriesContextTF\Font series context}%
500 \DeclareRobustCommand\IfFontSeriesContextTF[1]{%
501   \expand@font@defaults

```

In the beginning we haven't found the context we are looking for.

```

502   \font@series@contextfalse

```

We store the requested context away for use in the tests.

```

503   \def\requested@test@context{#1}%

```

The next definition is there to ensure that get a final match during testing even if the current family is non of the meta families (`rm`, `sf` or `tt`). This will then basically tests if the current font family matches the overall default.

```

504   \expandafter\edef\csname ??def@ult\endcsname{\f@family}%

```

Then we run through the meta family list (currently containing just the three values) followed by the artificial meta family `??` and test each of them in turn using `\test@font@series@context` as the testing command.

```

505   \let\@elt\test@font@series@context
506   \@meta@family@list
507   \@elt{??}%
508   \let\@elt\relax

```

Following that we evaluate the status of `\if@font@series@context` to determine which of the remaining arguments (true/false case) we have to execute.

```

509   \if@font@series@context
510   \expandafter\@firstoftwo
511   \else
512   \expandafter\@secondoftwo
513   \fi
514 }

```

(End definition for `\IfFontSeriesContextTF`.)

`\test@font@series@context` This tests the context (stored in `\requested@test@context`) and updates the boolean if the right context is found.

```

515 \def\test@font@series@context#1{%

```

First task is to figure out whether the current family matches `\rmfamily`, `\sffamily`, etc. so in `\reserved@a` we store the value of `\rmdef@ult` (or whatever the given meta family is) and compare that to `\f@family`.

```

516   \edef\reserved@a{\csname #1def@ult\endcsname}%
517   \ifx\f@family\reserved@a

```

If they match we have found the right meta family so we don't need to test any of the remaining meta family and therefore change `\@elt` to `\@gobble`.

```

518   \let\@elt\@gobble

```

Now we have to test if `\f@series` matches the requested context (e.g., whether `\bfseries@rm` has that value if the current meta family is `rm` and we are looking for the `bf` context).

```
519 \expandafter\ifx
520 \csname\requested@test@context series@#1\endcsname\f@series
```

If yes we change the boolean and are done.

```
521 \@font@series@contexttrue
```

If not then maybe the reason is that nothing special was set up for that meta family so we also check now check if `\f@series` matches the overall default (e.g., `\bfdef@ult` if we are looking for the bold context). If that matches we change the boolean.

```
522 \else
523 \expandafter\ifx
524 \csname\requested@test@context def@ult\endcsname\f@series
525 \@font@series@contexttrue
526 \fi\fi\fi
527 }
```

(End definition for `\test@font@series@context`.)

`\if@font@series@context` The boolean to signal if we found the requested font series context.

```
528 \newif\if@font@series@context
```

(End definition for `\if@font@series@context`.)

```
529 </2kernel | latexrelease>
530 <latexrelease>\EndIncludeInRelease

531 <latexrelease>\IncludeInRelease{0000/00/00}%
532 <latexrelease> \IfFontSeriesContextTF{Font series context}%
533 <latexrelease>
534 <latexrelease>\let\IfFontSeriesContextTF\@undefined
535 <latexrelease>\let\test@font@series@context\@undefined
536 <latexrelease>\let\if@font@series@context\@undefined
537 <latexrelease>\let\@font@series@contexttrue\@undefined
538 <latexrelease>\let\@font@series@contextfalse\@undefined
539 <latexrelease>\EndIncludeInRelease
540 <*2kernel>
```

### 3 Supporting nested emphasis

By default  $\text{\LaTeX} 2_{\epsilon}$  supports two levels of nested emphasis: if the current font has an upright shape then it switches to `\itshape` otherwise to `\emminnershape` (which defaults to `\upshape`). This means nested emphasis will oscillate between italic and upright shapes.

Sometimes it would be nice to allow for a more lengthy sequence, but instead of providing a fixed one  $\text{\LaTeX}$  now offers a general mechanism that allows to define arbitrary sequences.

```
\DeclareEmphSequence
\emforce
```

This declaration expects a comma separated list of (font) change declarations corresponding to increasing levels of emphasis. The mechanism tries to be “smart” and verifies that the declarations actually alter the font. If not it will ignore this level and tries the next one—the assumption being that there was a manual font change in the document



to the font that is now supposed to be used for emphasis. Of course, this only works if the declarations in the list actually change the font and not, say, just the color. In such a case one has to use `\emforce` to which directs the mechanism to use the level even if the font attributes haven't changed.

`\emreset` If the nesting is so deep, that the specified levels are exhausted then `\emreset` is used as a final set of declarations (which by default returns back to the upright shape). Any additional nesting levels will then reuse the list from its beginning.

`\DeclareEmphSequence` `\DeclareEmphSequence` expects a clist of declaration. Spaces in the argument are dropped to avoid spurious spaces in the output. The declarations are additive. At the very end the shape is reset using `\emreset` and `\emforce` so that this case is never skipped.<sup>29</sup> Further nested calls restart at the beginning.

```
541 </2ekernel>
542 <*2ekernel | latexrelease>
543 <latexrelease>\IncludeInRelease{2020/02/02}%
544 <latexrelease>{\DeclareEmphSequence}{Nested emph}%
545 \def\DeclareEmphSequence#1{%
546   \protected@edef\emfontdeclare@clist{\zap@space#1, \@empty\emforce\emreset}%
547 }
```

By default the it is empty, in which case `\eminnershape` is used by L<sup>A</sup>T<sub>E</sub>X.

```
548 \let\emfontdeclare@clist\@empty
```

*(End definition for \DeclareEmphSequence.)*

`\emrest` Reset the font to upright and upper/lower case. With the default rules using `\shapedefault` does that for us but to be on the safe side we do it like this:

```
549 \DeclareRobustCommand\emreset{\upshape\ulcshape}
```

*(End definition for \emrest.)*

`\em` The new definition for `\em` (and implicitly `\emph`) is the same as before as long as `\emfontdeclare@clist` is empty.

```
550 \DeclareRobustCommand\em{%
551   \@nomath\em
552   \ifx\emfontdeclare@clist\@empty
553     \ifdim \fontdimen\@ne\font >\z@
554       \eminnershape \else \itshape \fi
555   \else
```

But if not we use the list to decide how to do emphasis.

We use the current font to check if the declarations have any effect, so even a size change is allowed and identified as a modification (but a color change, for example, isn't). So first we save the current status.

```
556   \edef\em@currfont{\csname\curr@fontshape/\f@size\endcsname}%
557   \expandafter\do@emfont@update\emfontdeclare@clist\do@emfont@update
```

Then we grab the next element from the list and check if it can be used.

```
558   \fi
559 }
```

---

<sup>29</sup>Maybe we should not add `\emforce` but allow that case to be skipped as well. Of course, that might result in an endless loop if somebody defines a sequence without any font change and without `\emforce` but ...

```
560 \def\emminnershape{\upshape}
```

(End definition for \em.)

\do@emfont@update We know that the list (if not empty) has at least 2 elements separated by a comma, so we pick up the first in #1 and the rest in #2.

```
561 \def\do@emfont@update#1,#2\do@emfont@update{%
```

First action is to alter the list and move the first entry to the end

```
562 \def\emfontdeclare@clist{#2,#1}%
```

Then we execute current declaration. Appending \selectfont means one can write just \fontshape{it}} and that works then too.

```
563 % \typeout{Use: \detokenize{#1}}%
```

```
564 #1\selectfont
```

We then compare the current font with our saved version, but with a slight twist: we add \em@force at the end of the name. Normally this is empty so has no effect but if there was an \emforce as part of #1 it will append a / to the font name (making it invalid) thus this will then always fail the test.

If the test fails we are done and the declarations will be used. Otherwise we will try the next declaration in the sequence.

```
565 \expandafter\ifx\csname \curr@fontshape/\f@size\em@force
```

For the comparison with \ifx we have to expand \em@currfont once as the relevant info is inside.

```
566 \expandafter\endcsname
```

```
567 \em@currfont
```

```
568 \expandafter\do@emfont@update\emfontdeclare@clist\do@emfont@update
```

If \emforce was used, we have to undo its effect:

```
569 \else
```

```
570 \let\em@force\@empty
```

```
571 \fi
```

```
572 }
```

(End definition for \do@emfont@update.)

\emforce The definition of \emforce is simple: change \em@force to make the above test always invalid.

```
573 \protected\def\emforce{\def\em@force{/}}
```

```
574 \let\em@force\@empty
```

```
575 </2ekernel | latexrelease>
```

```
576 <latexrelease>\EndIncludeInRelease
```

(End definition for \emforce and \em@force.)

\em These are the older definitions for \em, prior to 2020.

\emminnershape We also have to define the *emphasize* font change command (i.e. \em). This command will look is the current font is sloped (i.e. has a positive \fontdimen1) and will then select either \upshape or \itshape.

```
577 <latexrelease>\IncludeInRelease{2015/01/01}{\DeclareEmphSequence}{Nested emph}%
```

```
578 <latexrelease>\let\DeclareEmphSequence\@undefined
```

```
579 <latexrelease>\let\emfontdeclare@clist\@undefined
```

```
580 <latexrelease>\let\emreset\@undefined
```

```
581 <latexrelease>\let\do@emfont@update\@undefined
```

```

582 <latexrelease>\let\emforce\@undefined
583 <latexrelease>\let\em@force\@undefined
584 <latexrelease>
585 <latexrelease>\DeclareRobustCommand\em
586 <latexrelease>          {\@nomath\em \ifdim \fontdimen\@ne\font >\z@
587 <latexrelease>          \eminnershape \else \itshape \fi}%
588 <latexrelease>\EndIncludeInRelease
589 <latexrelease>
590 <latexrelease>\IncludeInRelease{0000/00/00}{\DeclareEmphSequence}{Nested emph}%
591 <latexrelease>\DeclareRobustCommand\em
592 <latexrelease>          {\@nomath\em \ifdim \fontdimen\@ne\font >\z@
593 <latexrelease>          \upshape \else \itshape \fi}%
594 <latexrelease>\let\eminnershape\@undefined
595 <latexrelease>\EndIncludeInRelease
596 <*2ekernel>

```

(End definition for \em and \eminnershape.)

`\not@math@alphabet` This function generates an error message when it is called in math mode. The same function should be defined in `newlfont.sty`.

```

597 \def\not@math@alphabet#1#2{%
598   \relax
599   \ifmmode
600     \@latex@error{Command \noexpand#1invalid in math mode}%
601     {%
602       Please
603       \ifx#2\relax
604         define a new math alphabet^^J%
605         if you want to use a special font in math mode%
606       \else
607         use the math alphabet \noexpand#2instead of
608         the #1command%
609       \fi
610       .
611     }%
612   \fi}

```

(End definition for \not@math@alphabet.)

Finally we provide two abbreviations to switch to the L<sup>A</sup>T<sub>E</sub>X versions.

```

613 \DeclareRobustCommand\boldmath{\@nomath\boldmath
614   \mathversion{bold}}
615 \DeclareRobustCommand\unboldmath{\@nomath\unboldmath
616   \mathversion{normal}}

```

Here we switch to the default math version by defining the internal macro `\math@version`. We dare not to call `\mathversion` at this place because this would call `\glb@settings`.

```

617 \def\math@version{normal}

```

### 3.1 Legacy

We start by defining a few macros that are part of standard L<sup>A</sup>T<sub>E</sub>X's user interface. The use of these functions is not encouraged, but they will allow to process older documents without changes to the source.

`\newfont`

```
618 \def\newfont#1#2{\@ifdefinable#1{\font#1=#2\relax}}
```

*(End definition for \newfont.)*

`\symbol`

```
619 </2ekernel>
620 <*2ekernel | latexrelease>
621 <latexrelease>\IncludeInRelease{2020/10/01}%
622 <latexrelease>          {\symbol}{XeTeX change for math}%
623 \ifdefinedXeTeXversion
624   \DeclareRobustCommand\symbol[1]{\Ucharcat#1 12\relax}
625 \else
626   \DeclareRobustCommand\symbol[1]{\char#1\relax}
627 \fi
628 </2ekernel | latexrelease>

629 <latexrelease>\EndIncludeInRelease
630 <latexrelease>\IncludeInRelease{0000/00/00}%
631 <latexrelease>          {\symbol}{XeTeX change for math}%
632 <latexrelease>
633 <latexrelease>\DeclareRobustCommand\symbol[1]{\char#1\relax}
634 <latexrelease>
635 <latexrelease>\EndIncludeInRelease
636 <*2ekernel>
```

*(End definition for \symbol.)*

### 3.2 Miscellaneous

`\@setfontsize`

This abbreviation is used by L<sup>A</sup>T<sub>E</sub>X's user level size changing commands, such as `\large`.

`\@setsize`

```
637 \def\@setfontsize#1#2#3{\@nomath#1%
```

For the benefit of people relying on keeping the name of the current font command saved in `\@currsiz` we define it. To ensure that `\@setfontsize` keeps being robust we omit this assignment during times where `\protect` differs from `\@typeset@protect`.

```
638   \ifx\protect\@typeset@protect
639     \let\@currsiz#1%
640   \fi
641   \fontsize{#2}{#3}\selectfont}
```

For compatibility we also define `\@setsize` the 209 command

```
642 <*compat>
643 \def\@setsize#1#2#3#4{\@setfontsize#1{#4}{#2}}
644 </compat>
```

*(End definition for \@setfontsize and \@setsize.)*

`\hexnumber@` To set up L<sup>A</sup>T<sub>E</sub>X's special math character definitions we first provide a macro to generate hexadecimal numbers. It is a rather simple `\ifcase`.

```

645 \def\hexnumber@#1{\ifcase\number#1
646 0\or 1\or 2\or 3\or 4\or 5\or 6\or 7\or 8\or
647 9\or A\or B\or C\or D\or E\or F\fi}

```

(End definition for `\hexnumber@`.)

`\nfss@text` In its simplest form `\nfss@text` is an `\mbox`. This will produce unbreakable text outside math and inside math you will get text with the same fonts as outside. The only drawback is that such item won't change sizes in subscripts. But this behavior can be easily changed. With the `amstex` style option one will get a sub style called `amstext` which will redefine the `\nfss@text` macro to produce correct text in all sizes.

We have to use `\def` instead of the shorter `\let` since `\mbox` is undefined when we reach this point.

```

648 \def\nfss@text#1{{\mbox{#1}}}

```

(End definition for `\nfss@text`.)

`\copyright` The definition of `\copyright` was changed so that it works in other type styles, and to make it robust. We leave the family untouched so that the copyright notice will come out differently if a different font family is in use. This command is commented out, since it is now defined in `ltoutenc.dtx`.

```

649 %\DeclareRobustCommand\copyright
650 %    {\ooalign{\hfil
651 %        \raise.07ex\hbox{\mdseries\upshape c}\hfil\crcr
652 %        \mathhexbox20D}}

```

(End definition for `\copyright`.)

`\normalfont` The macro `\reset@font` is used in L<sup>A</sup>T<sub>E</sub>X to switch to a standard font, in order to initialize the current font in situations where typesetting is done in a new visual context (e.g. in a footnote). We define it here to allow the test for the new L<sup>A</sup>T<sub>E</sub>X version above but nevertheless are able to run all kind of mixtures.

The user interface name for `\reset@font` is `\normalfont`:

```

653 </2ekernel>
654 <*2ekernel | latexrelease>
655 <latexrelease>\IncludeInRelease{2021/06/01}%
656 <latexrelease>          {\normalfont}{Add hook to \normalfont}%
657 \DeclareRobustCommand\normalfont{%

```

Instead of calling `\usefont`, as it was done in the past, we inline the code from `\usefont` as we want to add the hook before `\selectfont`, but after all the font attributes are set.

```

658 \fontencoding\encodingdefault
659 \edef\f@family{\familydefault}%
660 \edef\f@series{\seriesdefault}%
661 \edef\f@shape{\shapedefault}%

```

Any earlier `\fontseries`, etc. should be canceled and we should switch unconditionally to the requested font face so we drop any code that may have been stored in `\delayed@f@adjustment`.

```

662 \let\delayed@f@adjustment\@empty
663 \UseHook{normalfont}%

```

This is the old name for the hook introduced in 2020/02/02. It will be removed in one of the future releases!

```

664 \@@defaultfamilyhook          % hookname from 2020/02 will vanish
665 \selectfont}

666 \let\reset@font\normalfont

(End definition for \normalfont and \reset@font.)

667 % \changes{v3.2g}{2021/03/18}
668 % {Add missing 2020/02/02 latexrelease entry.}
669 </2ekernel | latexrelease>
670 <latexrelease>\EndIncludeInRelease
671 <latexrelease>
672 <latexrelease>\IncludeInRelease{2020/10/01}%
673 <latexrelease> { \normalfont } {Add hook to \normalfont}%
674 <latexrelease>
675 <latexrelease>\DeclareRobustCommand\normalfont{%
676 <latexrelease> \fontencoding\encodingdefault
677 <latexrelease> \edef\f@family{\familydefault}%
678 <latexrelease> \edef\f@series{\seriesdefault}%
679 <latexrelease> \edef\f@shape{\shapedefault}%
680 <latexrelease> \UseHook{normalfont}%
681 <latexrelease> \@@defaultfamilyhook          % hookname from 2020/02 will vanish
682 <latexrelease> \selectfont}
683 <latexrelease>
684 <latexrelease>\let\reset@font\normalfont
685 <latexrelease>
686 <latexrelease>\EndIncludeInRelease
687 <latexrelease>
688 <latexrelease>\IncludeInRelease{2020/02/02}%
689 <latexrelease> { \normalfont } {Add hook to \normalfont}%
690 <latexrelease>
691 <latexrelease>\DeclareRobustCommand\normalfont{%
692 <latexrelease> \fontencoding\encodingdefault
693 <latexrelease> \edef\f@family{\familydefault}%
694 <latexrelease> \edef\f@series{\seriesdefault}%
695 <latexrelease> \edef\f@shape{\shapedefault}%
696 <latexrelease> \@@defaultfamilyhook
697 <latexrelease> \selectfont}
698 <latexrelease>
699 <latexrelease>\let\reset@font\normalfont
700 <latexrelease>
701 <latexrelease>\let\@@defaultfamilyhook\@empty
702 <latexrelease>
703 <latexrelease>\EndIncludeInRelease
704 <latexrelease>
705 <latexrelease>\IncludeInRelease{0000/00/00}%
706 <latexrelease> { \normalfont } {Add hook to \normalfont}%
707 <latexrelease>
708 <latexrelease>\DeclareRobustCommand\normalfont
709 <latexrelease> { \usefont\encodingdefault
710 <latexrelease> \familydefault
711 <latexrelease> \seriesdefault
712 <latexrelease> \shapedefault

```

```

713 <latexrelease> \relax}
714 <latexrelease>\let\reset@font\normalfont
715 <latexrelease>
716 <latexrelease>\let\@defaultfamilyhook\@undefined
717 <latexrelease>
718 <latexrelease>\EndIncludeInRelease
719 <*2ekernel>

```

We left out the special L<sup>A</sup>T<sub>E</sub>X fonts which are not automatically included in the base version of the font selection since these fonts contain only a few characters which are also included in the AMS fonts so anybody who is using these fonts doesn't need them. But for compatibility reasons we will define these symbols.

```

720 \def\not@base#1{\@latex@error
721   {Command \noexpand#1not provided in base LaTeX2e}%
722   {Load the latexsym or the amsfonts package to
723     define this symbol}}
724 \def\mho{\not@base\mho}
725 \def\Join{\not@base\Join}
726 \def\Box{\not@base\Box}
727 \def\Diamond{\not@base\Diamond}
728 \def\leadsto{\not@base\leadsto}
729 \def\squsubset{\not@base\squsubset}
730 \def\squsupset{\not@base\squsupset}
731 \def\lhd{\not@base\lhd}
732 \def\unlhd{\not@base\unlhd}
733 \def\rhd{\not@base\rhd}
734 \def\unrhd{\not@base\unrhd}

```

We now initialize all variables set by `\DeclareErrorFont`. These values are not really important since they will be overwritten later on by the definition in `fontdef.ltx`.

However, if `fontdef.cfg` is corrupted then at least a hopefully suitable error font is present.

```

735 \DeclareErrorFont{OT1}{cmr}{m}{n}{10}  %% don't modify this setting
736                                         %% overwrite it in fontdef.cfg
737                                         %% if necessary

```

We also set some default values for `\f@family` etc. Note that we don't yet have any encodings that comes later. In the past this was implicitly done by `\DeclareErrorFont`.

```

738 \fontfamily{cmr}

```

Previously the default values for series and shape were set by calling `\fontseries` and `\fontshape`, but their action is now delayed until `\selectfont` which isn't called inside the format (to avoid unnecessarily loading a font that may never get used). We therefore have to set `\f@series` and `\f@shape` directly instead.

```

739 \def\f@series{m}          % \fontseries{m}
740 \def\f@shape{n}          % \fontshape{n}
741 \fontsize{10}{10}

```

The initial `fontenc` package load list. This will get overwritten in `fonttext` and is only provided in case an old `fonttext.cfg` does not define the command:

```

742 \def\@fontenc@load@list{\@elt{T1,OT1}}

```

We now load the customizable parts of NFSS.

```

743 \InputIfFileExists{fonttext.cfg}
744     {\typeout{=====^^J%
745             ^^J%
746             Local config file fonttext.cfg used^^J%
747             ^^J%
748             =====}%
749     \def\@addtofilelist##1{\xdef\@filelist{\@filelist,##1}}%
750     }
751     {\input{fonttext.ltx}}
752 \let\@addtofilelist\@gobble

```

Ditto for math although I don't think that we will get a lot of customisation :-)

```

753 \InputIfFileExists{fontmath.cfg}
754     {\typeout{=====^^J%
755             ^^J%
756             Local config file fontmath.cfg used^^J%
757             ^^J%
758             =====}%
759     \def\@addtofilelist##1{\xdef\@filelist{\@filelist,##1}}%
760     }
761     {\input{fontmath.ltx}}
762 \let\@addtofilelist\@gobble

```

Then we preload several fonts. This file might be customized *without* changing the behavior of the format (i.e. necessary font definitions will be loaded at runtime if they are not preloaded). This is done in the file `preload.ltx`.

```

763 \InputIfFileExists{preload.cfg}
764     {\typeout{=====^^J%
765             ^^J%
766             Local config file preload.cfg used^^J%
767             ^^J%
768             =====}%
769     \def\@addtofilelist##1{\xdef\@filelist{\@filelist,##1}}%
770     }
771     {\input{preload.ltx}}
772 \let\@addtofilelist\@gobble

```

`\seriesdefault` After `\seriesdefault` got defined inside `fonttext.ltx` or a `.cfg` file overwriting it, we alter its value by appending `\@empty` to it. This will vanish if expanded but allows us to check if the default gets altered (even to the same value) in the document preamble. All we have to do is to save the current value somewhere and later compare the two. For this we use `\seriesdefault@kernel`.

```

773 \expandafter\def\expandafter\seriesdefault\expandafter{\seriesdefault\@empty}
774 \let\seriesdefault@kernel\seriesdefault

```

(End definition for `\seriesdefault` and `\seriesdefault@kernel`.)

`\@acci` We also save the values of some accents in `\@acci`, `\@accii` and `\@acciii` so they can be restored by a `minipage` inside a `tabbing` environment.

```

775 \let\@acci\' \let\@accii\' \let\@acciii\=

```

(End definition for `\@acci`, `\@accii`, and `\@acciii`.)

`\cal` Here were the two old *alphabet identifiers*.  
`\mit`



*(End definition for \cal and \mit.)*

776 \2ekernel

# File B

## fontdef.dtx

<-latexrelease> [2021/01/15 v3.0i LaTeX Kernel (<-latexrelease> font setup)]

### 1 Introduction

This file is used to generate the files `fonttext.ltx` (text font declarations) and `fontmath.ltx` (math font declarations), which are used during the format generation. It contains the declaration of the standard text encodings used at the site as well as a minimal subset of font shape groups that NFSS will look at to ensure that the specified encodings are valid.

The math part contains the setup for math encodings as well as the default math symbol declarations that belong to the encoding.

It is possible to change this setup (by using other fonts, or defaults) without losing the ability to process documents written at other sites. Portability in this sense means that a document will compile without errors. It does not mean, however, that identical output will be produced. For this it is necessary that the distributed setup is used at both installations.

### 2 Customization

You are not allowed to change this source file! If you want to change the default encodings and/or the font shape groups preloaded you should create a copy of `fonttext.ltx` under the name `fonttext.cfg` and change this copy. If  $\text{\LaTeX} 2_{\epsilon}$  finds a file of this name it will use it, otherwise it uses the standard file which is `fontdef.ltx`.

If you don't plan to use Computer Modern much or at all, it might (!) be a good idea to make your own `fonttext.cfg`. Look at the comments below (docstrip module 'text') to see what should go into such a file.

To change the math font setup use a copy of `fontmath.ltx` under the name `fontmath.cfg` and change this copy. However, dealing with this interface is even more a job for an expert than changing the text font setup — in short, we don't encourage either.

**Warning:** please note that we don't support customised  $\text{\LaTeX}$  versions. Thus, before sending in a bug report please try your test file with a  $\text{\LaTeX}$  format which is not customised and send in the log from that version (unless the problem goes away).

Please note: the following standard encodings have to be defined in all local variants of `font....cfg` to guarantee that all  $\text{\LaTeX}$  installations behave in the same way.

T1	Cork $\text{\TeX}$ text encoding
OT1	old $\text{\TeX}$ text encoding
U	unknown encoding
OML	old $\text{\TeX}$ math letters encoding
OMS	old $\text{\TeX}$ math symbols encoding
OMX	old $\text{\TeX}$ math extension symbols encoding
TU	Unicode

Notice that some of these encodings are ‘old’ in the sense that we hope that they will be superseded soon by encoding standards defined by the T<sub>E</sub>X user community. Therefore this set of default encodings may change in the future.

The first candidate is OT1 which will soon be replaced by T1, the official T<sub>E</sub>X text encoding.

**Warning:** If you add additional encodings to this file there is no guarantee any longer that files processable at your installation will also be processable at other installations. Thus, if you make use of such an encoding in your document, e.g. if you intend to typeset in Cyrillic (OT2 encoding), you need to specify this encoding in the preamble of your document prior to sending it to another installation. Once the encoding is specified in that place in your document, the document is processable at all L<sup>A</sup>T<sub>E</sub>X installations (provided they have suitable fonts installed).

For this reason we suggest that you define a short package file that sets up an additional encoding used at your site (rather than putting the encoding into this file) since this package can easily be shipped with your document.

### 3 The docstrip modules

The following modules are used to direct **docstrip** in generating external files:

driver	produce a documentation driver file
text	produce the file <b>fonttext.ltx</b>
math	produce the file <b>fontmath.ltx</b>
cfgtext	produce a dummy <b>fonttext.cfg</b> file
cfgmath	produce a dummy <b>fontmath.cfg</b> file

A typical **docstrip** command file would then have entries like:

```
generateFile{fonttext.ltx}{t}{\from{fontdef.dtx}{text}}
```

### 4 A driver for this document

The next bit of code contains the documentation driver file for T<sub>E</sub>X, i.e. the file that will produce the documentation you are currently reading. It will be extracted from this file by the DOCSTRIP program.

```
1 <*driver>
2 \documentclass{ltxdoc}
3 \GetFileInfo{fontdef.dtx}
4 \begin{document}
5   \DocInput{fontdef.dtx}
6 \end{document}
7 </driver>
```

### 5 The fonttext.ltx file

The identification is done earlier on with a \ProvidesFile declaration.

```
8 <*text>
9 \typeout{=== Don't modify this file, use a .cfg file instead ===^~J}
```

## 5.1 Encodings

This file declares the standard encodings for text and math fonts. All others should be declared in packages or in the documents directly.

For every text encoding there are normally a number of encoding specific commands, e.g. accents, special characters, etc. (The definition for such a command might have to change when the encoding is changed, because the character is in a different position, or not available at all, or the accent is produced in a different way.) This is handled by a general mechanism which is described in `ltoutenc.dtx`.

By convention, text encoding specific declarations, including the `\DeclareFontEncoding` declaration, are kept in separate file of the form `<enc>enc.def`, e.g. `ot1enc.def`. This allows other applications to make use of the declarations as well.

Similar to the default encoding, the loading of the encoding files for the two major text encodings shouldn't be changed. In particular, the `inputenc` package depends on this.

```
10 \input {omlenc.def}
11 \input {omsenc.def}
```

Documents containing a lot of accented characters should really be using T1 fonts. We therefore load this last so that T1 encoding specific commands are executed as fast as possible (encoding files are no longer reloaded in `fontenc`).

```
12 \input {ot1enc.def}
13 \input {t1enc.def}
14 \input{ts1enc.def}

15 \ifx\Umathcode\@undefined
```

We then set the default text font encoding. This will hopefully change some day to T1. This setting should *not* be changed to produce a portable format.

```
16 \fontencoding{OT1}

The initial fontenc package load list if an 8-bit TEX engine is used:
17 \def\@fontenc@load@list{\@elt{T1,OT1}}
18 \def\rmsubstdefault{cmr}
19 \def\sfsubstdefault{cmss}
20 \def\ttsubstdefault{cmtt}
21 \LoadFontDefinitionFile{TS1}{cmr}

22 \else
```

Unicode.

```
23 \input {tuenc.def}
24 \fontencoding{TU}

The initial fontenc package load list if a Unicode engine is used:
25 \def\@fontenc@load@list{\@elt{TU}}
26 \DeclareFontSubstitution{TU}{lmr}{m}{n}
27 \LoadFontDefinitionFile{TU}{lmr}
28 \LoadFontDefinitionFile{TU}{lmss}
29 \LoadFontDefinitionFile{TU}{lmtt}

30 \def\rmsubstdefault{lmr}
31 \def\sfsubstdefault{lmss}
32 \def\ttsubstdefault{lmtt}
33 \LoadFontDefinitionFile{TS1}{lmr}
```

```
34 \DeclareFontSubstitution{TU}{lmr}{m}{n}
```

End of Unicode branch.

```
35 \fi
```

If different encodings for text fonts are in use one could put the common setup into `\DeclareFontEncodingDefaults`. There is now a better mechanism so using this interface is discouraged!

```
36 \DeclareFontEncodingDefaults{}{}
```

Then we define the default substitution for every encoding. This release of  $\text{\LaTeX 2}_{\epsilon}$  assumes that the ec fonts are available. It is possible to change this to point to some other font family (e.g., Times with the appropriate encoding if it is available) without making documents non-portable. However, in such a case documents will produce different page breaks at other sites. The substitution defaults can all be changed without losing portability as long as there are font shape definitions for the selected substitutions.

```
37 \DeclareFontSubstitution{T1}{cmr}{m}{n}
```

```
38 \DeclareFontSubstitution{OT1}{cmr}{m}{n}
```

For every encoding declaration,  $\text{\LaTeX 2}_{\epsilon}$  will try to verify that the given substitution information makes sense, i.e. that it is impossible to go into an endless loop if font substitution happens. This is done at the moment the `\begin{document}` is encountered.  $\text{\LaTeX 2}_{\epsilon}$  will then check that for every encoding the substitution defaults form a valid font shape group, which means that it will check if there is a `\DeclareFontShape` declaration for this combination. We will therefore load the corresponding `.fd` files now. If we don't do this they would be loaded at verification time (i.e. at `\begin{document}`) which would delay processing unnecessarily.

**Warning:** Please note that this means that you have to regenerate the format whenever you change any of these `.fd` files since  $\text{\LaTeX 2}_{\epsilon}$  will not read `.fd` files if it already knows about the encoding/family combination.

The `\nfss@catcodes` ensures that white space is ignored in any definitions made in the `fd` files.

```
39 \begingroup
```

```
40 \nfss@catcodes
```

```
41 \input {t1cmr.fd}
```

```
42 \input {ot1cmr.fd}
```

```
43 \endgroup
```

We also load some other font definition files which are normally needed in a document. This is only done for processing speed and you can comment the next two lines out to save some memory. If necessary these files are then loaded when your document is processed. (Loading `.fd` files is a less drastic step compared to preloading fonts because the number of fonts is limited 255 at (nearly) every  $\text{\TeX}$  installation, while the amount of main memory is not a limiting factor at most installations.)

```
44 \begingroup
```

```
45 \nfss@catcodes
```

```
46 \input {ot1cmss.fd}
```

```
47 \input {ot1cmtt.fd}
```

```
48 \endgroup
```

Even with all the precautions it is still possible that NFSS will run into problems, for example, when a .fd file contains corrupted data. To guard against such cases NFSS has a very low-level fallback font that is installed with the following line.

```
49 \DeclareErrorFont{OT1}{cmr}{m}{n}{10}
```

This means, “if everything else fails use Computer Modern Roman normal shape at 10pt in the old text encoding”. You can change the font used but the encoding should be the same as the one specified with `\fontencoding` above.

## 5.2 Defaults

To allow the use of `\rmfamily`, `\sffamily`, etc. in documents even if non-standard families are used we provide nine macros which hold the name of the corresponding families, series, and so on. This makes it easy to use other font families (like Times Roman, etc.). One simply has to redefine these defaults.

All these hooks have to be defined in this file but you can change their meaning (except for `\encodingdefault`) without making documents non-portable.

```
\encodingdefault The following three definitions set up the meaning for \rmfamily, \sffamily, and
\rmdefault      \ttfamily.
\sfdefault      50 \ifx\Umathcode\@undefined
\ttdefault      51 \newcommand\encodingdefault{OT1}
                52 \newcommand\rmdefault{cmr}
                53 \newcommand\sfdefault{cmss}
                54 \newcommand\ttdefault{cmtt}
                55 \else
                56 \newcommand\encodingdefault{TU}
                57 \newcommand\rmdefault{lmr}
                58 \fontfamily{\rmdefault}
                59 \newcommand\sfdefault{lmss}
                60 \newcommand\ttdefault{lmtt}
                61 \fi
                62 </text>
                63 <latexrelease>\IncludeInRelease{2017/01/01}%
                64 <latexrelease>          {\encodingdefault}{TU encoding default}%
                65 <latexrelease>\ifx\Umathcode\@undefined
                66 <latexrelease>\renewcommand\encodingdefault{OT1}
                67 <latexrelease>\fontencoding{\encodingdefault}
                68 <latexrelease>\renewcommand\rmdefault{cmr}
                69 <latexrelease>\fontfamily{\rmdefault}
                70 <latexrelease>\renewcommand\sfdefault{cmss}
                71 <latexrelease>\renewcommand\ttdefault{cmtt}
                72 <latexrelease>\else
                73 <latexrelease>\renewcommand\encodingdefault{TU}
                74 <latexrelease>%done in everyjob\fontencoding{\encodingdefault}
                75 <latexrelease>\renewcommand\rmdefault{lmr}
                76 <latexrelease>\fontfamily{\rmdefault}
                77 <latexrelease>\renewcommand\sfdefault{lmss}
                78 <latexrelease>\renewcommand\ttdefault{lmtt}
                79 <latexrelease>\fi
                80 <latexrelease>\EndIncludeInRelease
                81 <latexrelease>\IncludeInRelease{0000/00/00}%
                82 <latexrelease>          {\encodingdefault}{TU encoding default}%
```

```

83 <latexrelease>\fontencoding{OT1}
84 <latexrelease>\renewcommand\encodingdefault{OT1}
85 <latexrelease>\fontencoding{\encodingdefault}
86 <latexrelease>\renewcommand\rmdefault{cmr}
87 <latexrelease>\fontfamily{\rmdefault}
88 <latexrelease>\renewcommand\sfddefault{cmss}
89 <latexrelease>\renewcommand\ttdefault{cmtt}
90 <latexrelease>\EndIncludeInRelease
91 <*text>

```

(End definition for \encodingdefault and others.)

```

\bfdefault Series changing commands are influenced by the following hooks.
\mddefault 92 \newcommand\bfdefault{b} % overwritten below (for rollback)
          93 \newcommand\mddefault{m} % overwritten below (for rollback)

```

(End definition for \bfdefault and \mddefault.)

```

\itdefault Shape changing commands use the following hooks.
\sldefault 94 \newcommand\itdefault{it}
\scdefault 95 \newcommand\sldefault{sl}
\updefault 96 \newcommand\scdefault{sc}
          97 \newcommand\updefault{up} % overwritten below (for rollback)

```

(End definition for \itdefault and others.)

```

98 </text>
99 <*text | latexrelease>
100 <latexrelease>\IncludeInRelease{2020/02/02}%
101 <latexrelease>          {\updefault}{font defaults change}%
102 % \begin{macrocode}
103 \renewcommand\updefault{up}

```

We append \@empty to the series value so that we can detect if it got changed via \def or \renewcommand later.

```

104 \renewcommand\bfdefault{b\@empty}
105 \renewcommand\mddefault{m\@empty}

106 \let\bfdefault@previous\bfdefault
107 \let\mddefault@previous\mddefault
108 </text | latexrelease>
109 <latexrelease>\EndIncludeInRelease
110 <latexrelease>\IncludeInRelease{0000/00/00}%
111 <latexrelease>          {\updefault}{font defaults change}%
112 <latexrelease>
113 <latexrelease>\renewcommand\updefault{n}
114 <latexrelease>\renewcommand\bfdefault{bx}
115 <latexrelease>
116 <latexrelease>\let\bfdefault@previous\undefined
117 <latexrelease>\let\mddefault@previous\undefined
118 <latexrelease>\EndIncludeInRelease
119 <*text>

```

`\familydefault` Finally we have the hooks that describe the behaviour of the `\normalfont` command.  
`\seriesdefault` To stay portable, the definition of `\encodingdefault` should *not* be changed and should  
`\shapedefault` match the setting above for `\fontencoding`. All other values can be set according to your taste.

```
120 \newcommand\familydefault{\rmdefault}
121 \newcommand\seriesdefault{\mddefault}
```

In previous releases `\shapedefault` pointed to `\updefault` which resolved to `n`, but these days that is no longer the case (and `up` is wrong when you want to do a reset. So we now use `n` explicitly.

```
122 \newcommand\shapedefault{n}
```

(End definition for `\familydefault`, `\seriesdefault`, and `\shapedefault`.)

This finishes the low-level setup in `fonttext.ltx`.

```
123 </text>
```

## 6 The fontmath.ltx file

The identification is done earlier on with a `\ProvidesFile` declaration.

```
124 <*math>
125 \typeout{=== Don't modify this file, use a .cfg file instead ===^~J}
```

### 6.1 The font encodings used

```
126 \DeclareFontEncoding{OML}{-}{-}
127 \DeclareFontEncoding{OMS}{-}{-}
128 \DeclareFontEncoding{OMX}{-}{-}
```

Finally a declaration for U encoding which serves for all fonts that do not fit standard encodings. For math this sets up `\noaccents@` providing for AMS- $\text{\LaTeX}$ . This macro is used therein to handle accented characters if they are not supported by the font. In other words, if fonts with U encoding are used in math, all accents (like from `\breve`) are obtained from some other font that has them.

```
129 \DeclareFontEncoding{U}{-}{\noaccents@}
```

The encodings for math are next:

```
130 \DeclareFontSubstitution{OML}{cmm}{m}{it}
131 \DeclareFontSubstitution{OMS}{cmsy}{m}{n}
132 \DeclareFontSubstitution{OMX}{cmex}{m}{n}
133 \DeclareFontSubstitution{U}{cmr}{m}{n}
134 \begingroup
135 \nfss@catcodes
136 \input {omlcmm.fd}
137 \input {omscmsy.fd}
138 \input {omxcmex.fd}
139 \input {ucmr.fd}
140 \endgroup
```

#### 6.1.1 Symbolfont and Alphabet declarations

We now define the basic symbol fonts used by  $\text{\LaTeX}$ . These four symbol fonts must be defined by this file.

It is possible to make the symbol fonts point to other external fonts without losing the ability to process documents written at other sites, as long as one defines the same



symbol font names with the same encodings, e.g. `operators` with OT1 etc. If other encodings are used documents become non-portable. Such a change should therefore be done in a package file.

```

141 \DeclareSymbolFont{operators}    {OT1}{cmr}{m}{n}
142 \DeclareSymbolFont{letters}     {OML}{cmm}{m}{it}
143 \DeclareSymbolFont{symbols}     {OMS}{cmsy}{m}{n}
144 \DeclareSymbolFont{largesymbols}{OMX}{cmex}{m}{n}

145 \SetSymbolFont{operators}{bold}{OT1}{cmr}{bx}{n}
146 \SetSymbolFont{letters}{bold}{OML}{cmm}{b}{it}
147 \SetSymbolFont{symbols}{bold}{OMS}{cmsy}{b}{n}

```

Below are the seven math alphabets which are defined by NFSS. Again they must be defined by this file. However, as before you can change the fonts used without losing portability, but you should be careful when changing the encoding since that may make documents come out wrong.

```

148 \DeclareSymbolFontAlphabet{\mathrm}    {operators}
149 \DeclareSymbolFontAlphabet{\mathnormal}{letters}
150 \DeclareSymbolFontAlphabet{\mathcal}    {symbols}
151 \DeclareMathAlphabet         {\mathbf}  {OT1}{cmr}{bx}{n}
152 \DeclareMathAlphabet         {\mathsf}  {OT1}{cmss}{m}{n}
153 \DeclareMathAlphabet         {\mathit}  {OT1}{cmr}{m}{it}
154 \DeclareMathAlphabet         {\mathtt}   {OT1}{cmtt}{m}{n}

```

Given the currently available fonts we cannot bold-en `\mathbf` and `\mathtt` but in principle one could use ‘ultra bold’ or something. The alphabets defined via `\DeclareSymbolFontAlphabet` will change automatically in a new math version if the corresponding symbol font changes.

```

155 \SetMathAlphabet\mathsf{bold}{OT1}{cmss}{bx}{n}
156 \SetMathAlphabet\mathit{bold}{OT1}{cmr}{bx}{it}

```

## 6.2 Math font sizes

The declarations below declare the text, script and scriptscript size to be used for each text font size.

All occurrences of sizes longer than a single character are replaced with the macro name that holds them, saving a number of tokens (but losing a bit of speed, so this may not stay this way).

```

157 \DeclareMathSizes{5}{5}{5}{5}
158 \DeclareMathSizes{6}{6}{5}{5}
159 \DeclareMathSizes{7}{7}{5}{5}
160 \DeclareMathSizes{8}{8}{6}{5}
161 \DeclareMathSizes{9}{9}{6}{5}
162 \DeclareMathSizes{\@xpt}{\@xpt}{7}{5}
163 \DeclareMathSizes{\@xipt}{\@xipt}{8}{6}
164 \DeclareMathSizes{\@xiipt}{\@xiipt}{8}{6}
165 \DeclareMathSizes{\@xivpt}{\@xivpt}{\@xpt}{7}
166 \DeclareMathSizes{\@xvipt}{\@xvipt}{\@xipt}{\@xpt}
167 \DeclareMathSizes{\@xxpt}{\@xxpt}{\@xivpt}{\@xiipt}
168 \DeclareMathSizes{\@xxvpt}{\@xxvpt}{\@xxpt}{\@xvipt}

```

### 6.3 The math symbol assignments

We start by setting up math codes for most of the characters typed in directly from the keyboard. Most of them are normally already setup up in the same way by `IniTEX`. However, we repeat them here to have a complete setup which can be exchanged with another if desired.

#### 6.3.1 The letters

```
169 \DeclareMathSymbol{a}{\mathalpha}{letters}{‘a}
170 \DeclareMathSymbol{b}{\mathalpha}{letters}{‘b}
171 \DeclareMathSymbol{c}{\mathalpha}{letters}{‘c}
172 \DeclareMathSymbol{d}{\mathalpha}{letters}{‘d}
173 \DeclareMathSymbol{e}{\mathalpha}{letters}{‘e}
174 \DeclareMathSymbol{f}{\mathalpha}{letters}{‘f}
175 \DeclareMathSymbol{g}{\mathalpha}{letters}{‘g}
176 \DeclareMathSymbol{h}{\mathalpha}{letters}{‘h}
177 \DeclareMathSymbol{i}{\mathalpha}{letters}{‘i}
178 \DeclareMathSymbol{j}{\mathalpha}{letters}{‘j}
179 \DeclareMathSymbol{k}{\mathalpha}{letters}{‘k}
180 \DeclareMathSymbol{l}{\mathalpha}{letters}{‘l}
181 \DeclareMathSymbol{m}{\mathalpha}{letters}{‘m}
182 \DeclareMathSymbol{n}{\mathalpha}{letters}{‘n}
183 \DeclareMathSymbol{o}{\mathalpha}{letters}{‘o}
184 \DeclareMathSymbol{p}{\mathalpha}{letters}{‘p}
185 \DeclareMathSymbol{q}{\mathalpha}{letters}{‘q}
186 \DeclareMathSymbol{r}{\mathalpha}{letters}{‘r}
187 \DeclareMathSymbol{s}{\mathalpha}{letters}{‘s}
188 \DeclareMathSymbol{t}{\mathalpha}{letters}{‘t}
189 \DeclareMathSymbol{u}{\mathalpha}{letters}{‘u}
190 \DeclareMathSymbol{v}{\mathalpha}{letters}{‘v}
191 \DeclareMathSymbol{w}{\mathalpha}{letters}{‘w}
192 \DeclareMathSymbol{x}{\mathalpha}{letters}{‘x}
193 \DeclareMathSymbol{y}{\mathalpha}{letters}{‘y}
194 \DeclareMathSymbol{z}{\mathalpha}{letters}{‘z}

195 \DeclareMathSymbol{A}{\mathalpha}{letters}{‘A}
196 \DeclareMathSymbol{B}{\mathalpha}{letters}{‘B}
197 \DeclareMathSymbol{C}{\mathalpha}{letters}{‘C}
198 \DeclareMathSymbol{D}{\mathalpha}{letters}{‘D}
199 \DeclareMathSymbol{E}{\mathalpha}{letters}{‘E}
200 \DeclareMathSymbol{F}{\mathalpha}{letters}{‘F}
201 \DeclareMathSymbol{G}{\mathalpha}{letters}{‘G}
202 \DeclareMathSymbol{H}{\mathalpha}{letters}{‘H}
203 \DeclareMathSymbol{I}{\mathalpha}{letters}{‘I}
204 \DeclareMathSymbol{J}{\mathalpha}{letters}{‘J}
205 \DeclareMathSymbol{K}{\mathalpha}{letters}{‘K}
206 \DeclareMathSymbol{L}{\mathalpha}{letters}{‘L}
207 \DeclareMathSymbol{M}{\mathalpha}{letters}{‘M}
208 \DeclareMathSymbol{N}{\mathalpha}{letters}{‘N}
209 \DeclareMathSymbol{O}{\mathalpha}{letters}{‘O}
210 \DeclareMathSymbol{P}{\mathalpha}{letters}{‘P}
211 \DeclareMathSymbol{Q}{\mathalpha}{letters}{‘Q}
212 \DeclareMathSymbol{R}{\mathalpha}{letters}{‘R}
213 \DeclareMathSymbol{S}{\mathalpha}{letters}{‘S}
```

```

214 \DeclareMathSymbol{T}{\mathalpha}{letters}{‘T}
215 \DeclareMathSymbol{U}{\mathalpha}{letters}{‘U}
216 \DeclareMathSymbol{V}{\mathalpha}{letters}{‘V}
217 \DeclareMathSymbol{W}{\mathalpha}{letters}{‘W}
218 \DeclareMathSymbol{X}{\mathalpha}{letters}{‘X}
219 \DeclareMathSymbol{Y}{\mathalpha}{letters}{‘Y}
220 \DeclareMathSymbol{Z}{\mathalpha}{letters}{‘Z}

```

### 6.3.2 The digits

```

221 \DeclareMathSymbol{0}{\mathalpha}{operators}{‘0}
222 \DeclareMathSymbol{1}{\mathalpha}{operators}{‘1}
223 \DeclareMathSymbol{2}{\mathalpha}{operators}{‘2}
224 \DeclareMathSymbol{3}{\mathalpha}{operators}{‘3}
225 \DeclareMathSymbol{4}{\mathalpha}{operators}{‘4}
226 \DeclareMathSymbol{5}{\mathalpha}{operators}{‘5}
227 \DeclareMathSymbol{6}{\mathalpha}{operators}{‘6}
228 \DeclareMathSymbol{7}{\mathalpha}{operators}{‘7}
229 \DeclareMathSymbol{8}{\mathalpha}{operators}{‘8}
230 \DeclareMathSymbol{9}{\mathalpha}{operators}{‘9}

```

### 6.3.3 Punctuation, brace, etc. keys

```

231 \DeclareMathSymbol{!}{\mathclose}{operators}{"21}
232 \DeclareMathSymbol{*}{\mathbin}{symbols}{"03} % \ast
233 \DeclareMathSymbol{+}{\mathbin}{operators}{"2B}
234 \DeclareMathSymbol{,}{\mathpunct}{letters}{"3B}
235 \DeclareMathSymbol{-}{\mathbin}{symbols}{"00}
236 \DeclareMathSymbol{.}{\mathord}{letters}{"3A}
237 \DeclareMathSymbol{:}{\mathrel}{operators}{"3A}
238 \DeclareMathSymbol{;}{\mathpunct}{operators}{"3B}
239 \DeclareMathSymbol{=}{\mathrel}{operators}{"3D}
240 \DeclareMathSymbol{?}{\mathclose}{operators}{"3F}

```

The following symbols are defined as delimiters below which automatically defines them as math symbols.

```

241 %\DeclareMathSymbol{({\mathopen}{operators}{"28}
242 %\DeclareMathSymbol{)}{\mathclose}{operators}{"29}
243 %\DeclareMathSymbol{/}{\mathord}{letters}{"3D}
244 %\DeclareMathSymbol{[}{\mathopen}{operators}{"5B}
245 %\DeclareMathSymbol{]}{\mathclose}{operators}{"5D}
246 %\DeclareMathSymbol{|}{\mathord}{symbols}{"6A}
247 %\DeclareMathSymbol{<}{\mathrel}{letters}{"3C}
248 %\DeclareMathSymbol{>}{\mathrel}{letters}{"3E}

```

Should all of the following being activated by default? Probably not.

```

249 %\DeclareMathSymbol{\}{\mathopen}{symbols}{"66}
250 %\DeclareMathSymbol{'}{\mathclose}{symbols}{"67}
251 %\DeclareMathSymbol{\backslash}{\mathord}{symbols}{"6E} % \backslash
252 \mathcode'\ = "8000 % \space
253 \mathcode'\ ' = "8000 % ^\prime
254 \mathcode'\_ = "8000 % \_

```

### 6.3.4 Delimitercodes for characters

[to be completed]

Finally, `InitEX` sets all `\delcode` values to -1, except `\delcode' = 0`

```

255 \DeclareMathDelimiter{({\mathopen}{operators}{28}{largesymbols}{00}
256 \DeclareMathDelimiter{)}{\mathclose}{operators}{29}{largesymbols}{01}
257 \DeclareMathDelimiter{[{\mathopen}{operators}{5B}{largesymbols}{02}
258 \DeclareMathDelimiter{]}\mathclose}{operators}{5D}{largesymbols}{03}

```

The next two are considered to be relations when not used in the context of a delimiter! And worse, they do even represent different glyphs when being used as delimiter and not as delimiter. This is a user level syntax inherited from plain  $\TeX$ . Therefore we explicitly redefine the math symbol definitions for these symbols afterwards.

```

259 \DeclareMathDelimiter{<{\mathopen}{symbols}{68}{largesymbols}{0A}
260 \DeclareMathDelimiter{>{\mathclose}{symbols}{69}{largesymbols}{0B}
261 \DeclareMathSymbol{<}{\mathrel}{letters}{3C}
262 \DeclareMathSymbol{>}{\mathrel}{letters}{3E}

```

And here is another case where the non-delimiter version produces a glyph different from the delimiter version.

```

263 \DeclareMathDelimiter{/}{\mathord}{operators}{2F}{largesymbols}{0E}
264 \DeclareMathSymbol{/}{\mathord}{letters}{3D}

265 \DeclareMathDelimiter{|}{\mathord}{symbols}{6A}{largesymbols}{0C}

266 \expandafter\DeclareMathDelimiter\@backslashchar
267 \mathord}{symbols}{6E}{largesymbols}{0F}

```

N.B. { and } should NOT get delcodes; otherwise parameter grouping fails!

## 6.4 Symbols accessed via control sequences

### 6.4.1 Greek letters

```

268 \DeclareMathSymbol{\alpha}{\mathord}{letters}{0B}
269 \DeclareMathSymbol{\beta}{\mathord}{letters}{0C}
270 \DeclareMathSymbol{\gamma}{\mathord}{letters}{0D}
271 \DeclareMathSymbol{\delta}{\mathord}{letters}{0E}
272 \DeclareMathSymbol{\epsilon}{\mathord}{letters}{0F}
273 \DeclareMathSymbol{\zeta}{\mathord}{letters}{10}
274 \DeclareMathSymbol{\eta}{\mathord}{letters}{11}
275 \DeclareMathSymbol{\theta}{\mathord}{letters}{12}
276 \DeclareMathSymbol{\iota}{\mathord}{letters}{13}
277 \DeclareMathSymbol{\kappa}{\mathord}{letters}{14}
278 \DeclareMathSymbol{\lambda}{\mathord}{letters}{15}
279 \DeclareMathSymbol{\mu}{\mathord}{letters}{16}
280 \DeclareMathSymbol{\nu}{\mathord}{letters}{17}
281 \DeclareMathSymbol{\xi}{\mathord}{letters}{18}
282 \DeclareMathSymbol{\pi}{\mathord}{letters}{19}
283 \DeclareMathSymbol{\rho}{\mathord}{letters}{1A}
284 \DeclareMathSymbol{\sigma}{\mathord}{letters}{1B}
285 \DeclareMathSymbol{\tau}{\mathord}{letters}{1C}
286 \DeclareMathSymbol{\upsilon}{\mathord}{letters}{1D}
287 \DeclareMathSymbol{\phi}{\mathord}{letters}{1E}
288 \DeclareMathSymbol{\chi}{\mathord}{letters}{1F}
289 \DeclareMathSymbol{\psi}{\mathord}{letters}{20}
290 \DeclareMathSymbol{\omega}{\mathord}{letters}{21}
291 \DeclareMathSymbol{\varepsilon}{\mathord}{letters}{22}
292 \DeclareMathSymbol{\vartheta}{\mathord}{letters}{23}
293 \DeclareMathSymbol{\varpi}{\mathord}{letters}{24}

```

```

294 \DeclareMathSymbol{\varrho}{\mathord}{letters}{25}
295 \DeclareMathSymbol{\varsigma}{\mathord}{letters}{26}
296 \DeclareMathSymbol{\varphi}{\mathord}{letters}{27}
297 \DeclareMathSymbol{\Gamma}{\mathalpha}{operators}{00}
298 \DeclareMathSymbol{\Delta}{\mathalpha}{operators}{01}
299 \DeclareMathSymbol{\Theta}{\mathalpha}{operators}{02}
300 \DeclareMathSymbol{\Lambda}{\mathalpha}{operators}{03}
301 \DeclareMathSymbol{\Xi}{\mathalpha}{operators}{04}
302 \DeclareMathSymbol{\Pi}{\mathalpha}{operators}{05}
303 \DeclareMathSymbol{\Sigma}{\mathalpha}{operators}{06}
304 \DeclareMathSymbol{\Upsilon}{\mathalpha}{operators}{07}
305 \DeclareMathSymbol{\Phi}{\mathalpha}{operators}{08}
306 \DeclareMathSymbol{\Psi}{\mathalpha}{operators}{09}
307 \DeclareMathSymbol{\Omega}{\mathalpha}{operators}{0A}

```

#### 6.4.2 Ordinary symbols

```

308 \DeclareMathSymbol{\aleph}{\mathord}{symbols}{40}
309 \DeclareMathSymbol{\imath}{\mathord}{letters}{7B}
310 \DeclareMathSymbol{\jmath}{\mathord}{letters}{7C}
311 \DeclareMathSymbol{\ell}{\mathord}{letters}{60}
312 \DeclareMathSymbol{\wp}{\mathord}{letters}{7D}
313 \DeclareMathSymbol{\Re}{\mathord}{symbols}{3C}
314 \DeclareMathSymbol{\Im}{\mathord}{symbols}{3D}
315 \DeclareMathSymbol{\partial}{\mathord}{letters}{40}
316 \DeclareMathSymbol{\infty}{\mathord}{symbols}{31}
317 \DeclareMathSymbol{\prime}{\mathord}{symbols}{30}
318 \DeclareMathSymbol{\emptyset}{\mathord}{symbols}{3B}
319 \DeclareMathSymbol{\nabla}{\mathord}{symbols}{72}
320 \DeclareMathSymbol{\top}{\mathord}{symbols}{3E}
321 \DeclareMathSymbol{\bot}{\mathord}{symbols}{3F}
322 \DeclareMathSymbol{\triangle}{\mathord}{symbols}{34}
323 \DeclareMathSymbol{\forall}{\mathord}{symbols}{38}
324 \DeclareMathSymbol{\exists}{\mathord}{symbols}{39}
325 \DeclareMathSymbol{\neg}{\mathord}{symbols}{3A}

```

Alias:

```

326 % \let\lnot=\neg
327 \DeclareMathSymbol{\lnot}{\mathord}{symbols}{3A}
328 \DeclareMathSymbol{\flat}{\mathord}{letters}{5B}
329 \DeclareMathSymbol{\natural}{\mathord}{letters}{5C}
330 \DeclareMathSymbol{\sharp}{\mathord}{letters}{5D}
331 \DeclareMathSymbol{\clubsuit}{\mathord}{symbols}{7C}
332 \DeclareMathSymbol{\diamondsuit}{\mathord}{symbols}{7D}
333 \DeclareMathSymbol{\heartsuit}{\mathord}{symbols}{7E}
334 \DeclareMathSymbol{\spadesuit}{\mathord}{symbols}{7F}

335 \DeclareRobustCommand\hbar{{\mathchar'26\mkern-9mu h}}
336 \DeclareRobustCommand\surd{{\mathchar"1270}}
337 \DeclareRobustCommand\angle{{\vbox{\ialign{$\m@th\scriptstyle##$\crrc
338 \not\mathrel{\mkern14mu}\crrc
339 \noalign{\nointerlineskip}
340 \mkern2.5mu\leaders\hrule \@height.34pt\hfill\mkern2.5mu\crrc}}}}

```

#### 6.4.3 Large Operators

```

341 \DeclareMathSymbol{\coprod}{\mathop}{largesymbols}{60}

```

```

342 \DeclareMathSymbol{\bigvee}{\mathop}{largesymbols}{57}
343 \DeclareMathSymbol{\bigwedge}{\mathop}{largesymbols}{56}
344 \DeclareMathSymbol{\biguplus}{\mathop}{largesymbols}{55}
345 \DeclareMathSymbol{\bigcap}{\mathop}{largesymbols}{54}
346 \DeclareMathSymbol{\bigcup}{\mathop}{largesymbols}{53}
347 \DeclareMathSymbol{\intop}{\mathop}{largesymbols}{52}
348 \DeclareRobustCommand\int{\intop\nolimits}
349 \DeclareMathSymbol{\prod}{\mathop}{largesymbols}{51}
350 \DeclareMathSymbol{\sum}{\mathop}{largesymbols}{50}
351 \DeclareMathSymbol{\bigotimes}{\mathop}{largesymbols}{4E}
352 \DeclareMathSymbol{\bigoplus}{\mathop}{largesymbols}{4C}
353 \DeclareMathSymbol{\bigodot}{\mathop}{largesymbols}{4A}
354 \DeclareMathSymbol{\ointop}{\mathop}{largesymbols}{48}
355 \DeclareRobustCommand\oint{\ointop\nolimits}
356 \DeclareMathSymbol{\bigsqcup}{\mathop}{largesymbols}{46}
357 \DeclareMathSymbol{\smallint}{\mathop}{symbols}{73}

```

#### 6.4.4 Binary symbols

```

358 \DeclareMathSymbol{\triangleleft}{\mathbin}{letters}{2F}
359 \DeclareMathSymbol{\triangleright}{\mathbin}{letters}{2E}
360 \DeclareMathSymbol{\bigtriangleup}{\mathbin}{symbols}{34}
361 \DeclareMathSymbol{\bigtriangledown}{\mathbin}{symbols}{35}

```

Alias:

```

362 % \let \varbigtriangledown \bigtriangledown
363 % \let \varbigtriangleup \bigtriangleup
364 \DeclareMathSymbol{\varbigtriangleup}{\mathbin}{symbols}{34}
365 \DeclareMathSymbol{\varbigtriangledown}{\mathbin}{symbols}{35}

```

These last two synonyms are needed because the `stmaryrd` package redefines them as Operators.

```

366 \DeclareMathSymbol{\wedge}{\mathbin}{symbols}{5E}
367 \DeclareMathSymbol{\vee}{\mathbin}{symbols}{5F}

```

Alias:

```

368 % \let \land = \wedge
369 % \let \lor = \vee
370 \DeclareMathSymbol{\land}{\mathbin}{symbols}{5E}
371 \DeclareMathSymbol{\lor}{\mathbin}{symbols}{5F}
372 \DeclareMathSymbol{\cap}{\mathbin}{symbols}{5C}
373 \DeclareMathSymbol{\cup}{\mathbin}{symbols}{5B}
374 \DeclareMathSymbol{\ddagger}{\mathbin}{symbols}{7A}
375 \DeclareMathSymbol{\dagger}{\mathbin}{symbols}{79}
376 \DeclareMathSymbol{\sqcap}{\mathbin}{symbols}{75}
377 \DeclareMathSymbol{\sqcup}{\mathbin}{symbols}{74}
378 \DeclareMathSymbol{\uplus}{\mathbin}{symbols}{5D}
379 \DeclareMathSymbol{\amalg}{\mathbin}{symbols}{71}
380 \DeclareMathSymbol{\diamond}{\mathbin}{symbols}{05}
381 \DeclareMathSymbol{\bullet}{\mathbin}{symbols}{0F}
382 \DeclareMathSymbol{\wr}{\mathbin}{symbols}{6F}
383 \DeclareMathSymbol{\div}{\mathbin}{symbols}{04}
384 \DeclareMathSymbol{\odot}{\mathbin}{symbols}{0C}
385 \DeclareMathSymbol{\oslash}{\mathbin}{symbols}{0B}
386 \DeclareMathSymbol{\otimes}{\mathbin}{symbols}{0A}
387 \DeclareMathSymbol{\ominus}{\mathbin}{symbols}{09}

```

```

388 \DeclareMathSymbol{\oplus}{\mathbin}{symbols}{"08}
389 \DeclareMathSymbol{\mp}{\mathbin}{symbols}{"07}
390 \DeclareMathSymbol{\pm}{\mathbin}{symbols}{"06}
391 \DeclareMathSymbol{\circ}{\mathbin}{symbols}{"0E}
392 \DeclareMathSymbol{\bigcirc}{\mathbin}{symbols}{"0D}
393 \DeclareMathSymbol{\setminus}{\mathbin}{symbols}{"6E}
394 \DeclareMathSymbol{\cdot}{\mathbin}{symbols}{"01}
395 \DeclareMathSymbol{\ast}{\mathbin}{symbols}{"03}
396 \DeclareMathSymbol{\times}{\mathbin}{symbols}{"02}
397 \DeclareMathSymbol{\star}{\mathbin}{letters}{"3F}

```

#### 6.4.5 Relations

```

398 \DeclareMathSymbol{\propto}{\mathrel}{symbols}{"2F}
399 \DeclareMathSymbol{\sqsubseteq}{\mathrel}{symbols}{"76}
400 \DeclareMathSymbol{\sqsupseteq}{\mathrel}{symbols}{"77}
401 \DeclareMathSymbol{\parallel}{\mathrel}{symbols}{"6B}
402 \DeclareMathSymbol{\mid}{\mathrel}{symbols}{"6A}
403 \DeclareMathSymbol{\dashv}{\mathrel}{symbols}{"61}
404 \DeclareMathSymbol{\vdash}{\mathrel}{symbols}{"60}
405 \DeclareMathSymbol{\nearrow}{\mathrel}{symbols}{"25}
406 \DeclareMathSymbol{\searrow}{\mathrel}{symbols}{"26}
407 \DeclareMathSymbol{\nwarrow}{\mathrel}{symbols}{"2D}
408 \DeclareMathSymbol{\swarrow}{\mathrel}{symbols}{"2E}
409 \DeclareMathSymbol{\Leftrightarrow}{\mathrel}{symbols}{"2C}
410 \DeclareMathSymbol{\Leftarrow}{\mathrel}{symbols}{"28}
411 \DeclareMathSymbol{\Rightarrow}{\mathrel}{symbols}{"29}
412 \DeclareRobustCommand\neq{\not=}

```

As `\neq` is robust we should not use `\let` to define `\ne` as then it would change if `\neq` changes.

```

413 \DeclareRobustCommand\ne{\not=}

```

It would ok to use `\let` for those declared by `\DeclareMathSymbol` but for a cleaner interface we avoid it always (just in case the internals change).

```

414 \DeclareMathSymbol{\leq}{\mathrel}{symbols}{"14}
415 \DeclareMathSymbol{\geq}{\mathrel}{symbols}{"15}

```

Alias:

```

416 % \let\le=\leq
417 % \let\ge=\geq
418 \DeclareMathSymbol{\le}{\mathrel}{symbols}{"14}
419 \DeclareMathSymbol{\ge}{\mathrel}{symbols}{"15}
420 \DeclareMathSymbol{\succ}{\mathrel}{symbols}{"1F}
421 \DeclareMathSymbol{\prec}{\mathrel}{symbols}{"1E}
422 \DeclareMathSymbol{\approx}{\mathrel}{symbols}{"19}
423 \DeclareMathSymbol{\succeeds}{\mathrel}{symbols}{"17}
424 \DeclareMathSymbol{\preceq}{\mathrel}{symbols}{"16}
425 \DeclareMathSymbol{\supset}{\mathrel}{symbols}{"1B}
426 \DeclareMathSymbol{\subset}{\mathrel}{symbols}{"1A}
427 \DeclareMathSymbol{\supseteq}{\mathrel}{symbols}{"13}
428 \DeclareMathSymbol{\subseteq}{\mathrel}{symbols}{"12}
429 \DeclareMathSymbol{\in}{\mathrel}{symbols}{"32}
430 \DeclareMathSymbol{\ni}{\mathrel}{symbols}{"33}

```

Alias:

```

431 % \let\owns=\ni

```

```

432 \DeclareMathSymbol{\owns}{\mathrel}{symbols}{"33}
433 \DeclareMathSymbol{\gg}{\mathrel}{symbols}{"1D}
434 \DeclareMathSymbol{\ll}{\mathrel}{symbols}{"1C}
435 \DeclareMathSymbol{\not}{\mathrel}{symbols}{"36}
436 \DeclareMathSymbol{\leftrightharrow}{\mathrel}{symbols}{"24}
437 \DeclareMathSymbol{\leftarrow}{\mathrel}{symbols}{"20}
438 \DeclareMathSymbol{\rightarrow}{\mathrel}{symbols}{"21}

Alias:
439 % \let\gets=\leftarrow
440 % \let\to=\rightarrow
441 \DeclareMathSymbol{\gets}{\mathrel}{symbols}{"20}
442 \DeclareMathSymbol{\to}{\mathrel}{symbols}{"21}
443 \DeclareMathSymbol{\mapstochar}{\mathrel}{symbols}{"37}
444 \DeclareRobustCommand\mapsto{\mapstochar\rightarrow}
445 \DeclareMathSymbol{\sim}{\mathrel}{symbols}{"18}
446 \DeclareMathSymbol{\simeq}{\mathrel}{symbols}{"27}
447 \DeclareMathSymbol{\perp}{\mathrel}{symbols}{"3F}
448 \DeclareMathSymbol{\equiv}{\mathrel}{symbols}{"11}
449 \DeclareMathSymbol{\asymp}{\mathrel}{symbols}{"10}
450 \DeclareMathSymbol{\smile}{\mathrel}{letters}{"5E}
451 \DeclareMathSymbol{\frown}{\mathrel}{letters}{"5F}
452 \DeclareMathSymbol{\leftharpoonup}{\mathrel}{letters}{"28}
453 \DeclareMathSymbol{\leftharpoondown}{\mathrel}{letters}{"29}
454 \DeclareMathSymbol{\rightharpoonup}{\mathrel}{letters}{"2A}
455 \DeclareMathSymbol{\rightharpoondown}{\mathrel}{letters}{"2B}

```

Here cometh much profligate robustification of math constructs. Warning: some of these commands may become non-robust if an AMS package is loaded.

Further potential problems: some math font packages may make unfortunate assumptions about some of these definitions that are not true of the robust versions we need.

```

456 \DeclareRobustCommand
457   \cong{\mathrel{\mathpalette@vereq\sim}} % congruence sign
458 \def@vereq#1#2{\lower.5p@\vbox{\lineskiplimit\maxdimen\lineskip-.5\p@
459   \ialign{$\m@th#1\hfil##\hfil$\crrc#2\crrc=\crrc}}
460 \DeclareRobustCommand
461   \notin{\mathrel{\m@th\mathpalette@cncel\in}}
462 \def@cncel#1#2{\m@th\oalign{$\hfil#1\mkern1mu/\hfil$\crrc#1#2$}}
463 \DeclareRobustCommand
464   \rightleftharpoons{\mathrel{\mathpalette\rlh@{}}}
465 \def\rlh@#1{\vcenter{\m@th\hbox{\oalign{\raise2pt
466   \hbox{$#1\rightharpoonup$}\crrc
467   $#1\leftharpoondown$}}}}
468 \DeclareRobustCommand
469   \doteq{\buildrel\textstyle.\over=}

```

#### 6.4.6 Arrows

```

470 \DeclareRobustCommand
471   \joinrel{\mathrel{\mkern-3mu}}
472 \DeclareRobustCommand
473   \relbar{\mathrel{\smash-}} % \smash, because -
474                               % has the same height as +

```



In contrast to `plain.tex` `\Relbar` got braces around the equal sign to guard against it being “math active” expanding to `\futurelet....` This might be the case when packages are implementing shorthands for math, e.g. `=>` meaning `\Rightarrow` etc. It would actually be better not to use `=` in such definitions but instead define something like `\mathequalsign` and use this. However we can’t do this now as it would break other math layouts where characters are in different places (since those wouldn’t know about the need for a new command name).

```

475 \DeclareRobustCommand
476   \Relbar{\mathrel{=}}
477 \DeclareMathSymbol{\lhook}{\mathrel}{letters}{"2C}
478   \DeclareRobustCommand\hookrightarrow{\lhook\joinrel\rightarrow}
479 \DeclareMathSymbol{\rhook}{\mathrel}{letters}{"2D}
480   \DeclareRobustCommand\hookleftarrow{\leftarrow\joinrel\rhook}
481 \DeclareRobustCommand
482   \bowtie{\mathrel{\triangleright\joinrel\mathrel{\triangleleft}}}
483 \DeclareRobustCommand
484   \models{\mathrel{|}\joinrel\Relbar}
485 \DeclareRobustCommand
486   \Longrightarrow{\Relbar\joinrel\rightarrow}

```

LaTeX Change: `\longrightarrow` and `\longleftarrow` redefined to make them robust.

```

487 \DeclareRobustCommand\longrightarrow
488   {\relbar\joinrel\rightarrow}
489 \DeclareRobustCommand\longleftarrow
490   {\leftarrow\joinrel\relbar}
491 \DeclareRobustCommand
492   \Longleftarrow{\Leftarrow\joinrel\Relbar}
493 \DeclareRobustCommand
494   \longmapsto{\mapstochar\longrightarrow}
495 \DeclareRobustCommand
496   \longlefttrightarrow{\leftarrow\joinrel\rightarrow}
497 \DeclareRobustCommand
498   \Longlefttrightarrow{\Leftarrow\joinrel\rightarrow}
499 \DeclareRobustCommand
500   \iff{\;\Longlefttrightarrow\;}

```

#### 6.4.7 Punctuation symbols

```

501 \DeclareMathSymbol{\ldotp}{\mathpunct}{letters}{"3A}
502 \DeclareMathSymbol{\cdotp}{\mathpunct}{symbols}{"01}
503 \DeclareMathSymbol{\colon}{\mathpunct}{operators}{"3A}

```

This is commented out, since `\ldots` is now defined in `loutenc.dtx`.

```

504 %\def\ldots{\mathinner{\ldotp\ldotp\ldotp}}
505 %\DeclareRobustCommand\ldots
506 %   {\relax\ifmmode\ldots\else\mbox{$\m@th\ldots$}\fi}
507 \DeclareRobustCommand
508   \cdots{\mathinner{\cdotp\cdotp\cdotp}}
509 \DeclareRobustCommand
510   \vdots{\vbox{\baselineskip4p@ \lineskiplimit\z@
511     \kern6p@\hbox{.}\hbox{.}\hbox{.}}}
512 \DeclareRobustCommand
513   \ddots{\mathinner{\mkern1mu\raise7p@
514     \vbox{\kern7p@\hbox{.}}\mkern2mu}

```

```
515 \raise4\p@\hbox{.}\mkern2mu\raise\p@\hbox{.}\mkern1mu}}
```

#### 6.4.8 Math accents

```
516 \DeclareMathAccent{\acute}{\mathalpha}{operators}{13}
517 \DeclareMathAccent{\grave}{\mathalpha}{operators}{12}
518 \DeclareMathAccent{\ddot}{\mathalpha}{operators}{7F}
519 \DeclareMathAccent{\tilde}{\mathalpha}{operators}{7E}
520 \DeclareMathAccent{\bar}{\mathalpha}{operators}{16}
521 \DeclareMathAccent{\breve}{\mathalpha}{operators}{15}
522 \DeclareMathAccent{\check}{\mathalpha}{operators}{14}
523 \DeclareMathAccent{\hat}{\mathalpha}{operators}{5E}
524 \DeclareMathAccent{\vec}{\mathord}{letters}{7E}
525 \DeclareMathAccent{\dot}{\mathalpha}{operators}{5F}
526 \DeclareMathAccent{\widetilde}{\mathord}{largesymbols}{65}
527 \DeclareMathAccent{\widehat}{\mathord}{largesymbols}{62}
```

For some reason plain T<sub>E</sub>X never bothered to provide a ring accent in math (although it is available in the fonts), but since we got a request for it here we go:

```
528 \DeclareMathAccent{\mathring}{\mathalpha}{operators}{17}
```

#### 6.4.9 Radicals

```
529 \DeclareMathRadical{\sqrtsign}{symbols}{70}{largesymbols}{70}
```

#### 6.4.10 Over and under something, etc

```
530 \DeclareRobustCommand\overrightarrow[1]{\vbox{\m@th\ialign{##\crrc
531 \rightarrowfill\crrc\noalign{\kern-\p@\nointerlineskip}
532 $\hfil\displaystyle{#1}\hfil$\crrc}}}
533 \DeclareRobustCommand\overleftarrow[1]{\vbox{\m@th\ialign{##\crrc
534 \leftarrowfill\crrc\noalign{\kern-\p@\nointerlineskip}%
535 $\hfil\displaystyle{#1}\hfil$\crrc}}}
536 \DeclareRobustCommand\overbrace[1]
537 {\mathop{\vbox{\m@th\ialign{##\crrc\noalign{\kern3\p@}%
538 \downbracefill\crrc\noalign{\kern3\p@\nointerlineskip}%
539 $\hfil\displaystyle{#1}\hfil$\crrc}}}\limits}
540 \DeclareRobustCommand\underbrace[1]{\mathop{\vtop{\m@th\ialign{##\crrc
541 $\hfil\displaystyle{#1}\hfil$\crrc
542 \noalign{\kern3\p@\nointerlineskip}%
543 \upbracefill\crrc\noalign{\kern3\p@}}}\limits}
```

(quite a waste of tokens, IMHO — Frank)

```
544 \DeclareRobustCommand\skew[3]
545 {{\muskip\z@#1mu\divide\muskip\z@\tw@ \mkern\muskip\z@
546 #2{\mkern-\muskip\z@#3}\mkern\muskip\z@}\mkern-\muskip\z@}{}}
547 \DeclareRobustCommand\rightarrowfill{${\m@th\smash-\mkern-7mu%
548 \cleaders\hbox{${\mkern-2mu\smash-\mkern-2mu$}\hfill
549 \mkern-7mu\mathord\rightarrow$}
550 \DeclareRobustCommand\leftarrowfill{${\m@th\mathord\leftarrow\mkern-7mu%
551 \cleaders\hbox{${\mkern-2mu\smash-\mkern-2mu$}\hfill
552 \mkern-7mu\smash-$}
553 \DeclareMathSymbol{\braceld}{\mathord}{largesymbols}{7A}
554 \DeclareMathSymbol{\bracerd}{\mathord}{largesymbols}{7B}
555 \DeclareMathSymbol{\bracelu}{\mathord}{largesymbols}{7C}
556 \DeclareMathSymbol{\braceru}{\mathord}{largesymbols}{7D}
557 \DeclareRobustCommand\downbracefill{${\m@th \setbox\z@\hbox{${\braceld$}%
558 \braceld\leaders\vrule \@height\ht\z@ \@depth\z@\hfill\braceru
```

```

559 \bracelu\leaders\vrule \@height\ht\z@ \@depth\z@\hfill\bracerd$}
560 \DeclareRobustCommand\upbracefill{$\math \setbox\z@\hbox{$\braceld$}%
561 \bracelu\leaders\vrule \@height\ht\z@ \@depth\z@\hfill\bracerd
562 \braceld\leaders\vrule \@height\ht\z@ \@depth\z@\hfill\braceru$}

```

#### 6.4.11 Delimiters

```

563 \DeclareMathDelimiter{\lmoustache} % top from (, bottom from )
564 {\mathopen}{largesymbols}{7A}{largesymbols}{40}
565 \DeclareMathDelimiter{\rmoustache} % top from ), bottom from (
566 {\mathclose}{largesymbols}{7B}{largesymbols}{41}
567 \DeclareMathDelimiter{\arrowvert} % arrow without arrowheads
568 {\mathord}{symbols}{6A}{largesymbols}{3C}
569 \DeclareMathDelimiter{\Arrowvert} % double arrow without arrowheads
570 {\mathord}{symbols}{6B}{largesymbols}{3D}
571 \DeclareMathDelimiter{\Vert}
572 {\mathord}{symbols}{6B}{largesymbols}{0D}

```

`\DeclareMathDelimiter` produces a command that is robust (with an internal macro containing the payload) so we should not use `\let` for making an alias

```

573 %\let\|=\Vert
574 \DeclareMathDelimiter{\|}
575 {\mathord}{symbols}{6B}{largesymbols}{0D}
576 \DeclareMathDelimiter{\vert}
577 {\mathord}{symbols}{6A}{largesymbols}{0C}
578 \DeclareMathDelimiter{\uparrow}
579 {\mathrel}{symbols}{22}{largesymbols}{78}
580 \DeclareMathDelimiter{\downarrow}
581 {\mathrel}{symbols}{23}{largesymbols}{79}
582 \DeclareMathDelimiter{\updownarrow}
583 {\mathrel}{symbols}{6C}{largesymbols}{3F}
584 \DeclareMathDelimiter{\Uparrow}
585 {\mathrel}{symbols}{2A}{largesymbols}{7E}
586 \DeclareMathDelimiter{\Downarrow}
587 {\mathrel}{symbols}{2B}{largesymbols}{7F}
588 \DeclareMathDelimiter{\Updownarrow}
589 {\mathrel}{symbols}{6D}{largesymbols}{77}
590 \DeclareMathDelimiter{\backslash} % for double coset G\backslash H
591 {\mathord}{symbols}{6E}{largesymbols}{0F}
592 \DeclareMathDelimiter{\rangle}
593 {\mathclose}{symbols}{69}{largesymbols}{0B}
594 \DeclareMathDelimiter{\langle}
595 {\mathopen}{symbols}{68}{largesymbols}{0A}
596 \DeclareMathDelimiter{\rbrace}
597 {\mathclose}{symbols}{67}{largesymbols}{09}
598 \DeclareMathDelimiter{\lbrace}
599 {\mathopen}{symbols}{66}{largesymbols}{08}
600 \DeclareMathDelimiter{\rceil}
601 {\mathclose}{symbols}{65}{largesymbols}{07}
602 \DeclareMathDelimiter{\lceil}
603 {\mathopen}{symbols}{64}{largesymbols}{06}
604 \DeclareMathDelimiter{\rfloor}
605 {\mathclose}{symbols}{63}{largesymbols}{05}
606 \DeclareMathDelimiter{\lfloor}
607 {\mathopen}{symbols}{62}{largesymbols}{04}

```

`\lgroup` There are three plain  $\TeX$  delimiters which are not fully supported by NFSS, since they  
`\rgroup` partly point into a bold `cmr` font. Allocating a full symbol font, just to have three  
`\bracevert` delimiters seems a bit too much given the limited space available. For this reason only  
the extensible sizes are supported. If this is not desired one can use, without losing  
portability, define `\mathbf` and `\mathtt` as font symbol alphabet (setting up `cmr/bx/n`  
and `cmtt/m/n` as symbol fonts first) and modify the delimiter declarations to point with  
their small variant to those symbol fonts. (This is done in `oldlfont.dtx` so look there  
for examples.)

```
608 \DeclareMathDelimiter{\lgroup} % extensible ( with sharper tips
609     {\mathopen}{largesymbols}{"3A}{largesymbols}{"3A}
610 \DeclareMathDelimiter{\rgroup} % extensible ) with sharper tips
611     {\mathclose}{largesymbols}{"3B}{largesymbols}{"3B}
612 \DeclareMathDelimiter{\bracevert} % the vertical bar that extends braces
613     {\mathord}{largesymbols}{"3E}{largesymbols}{"3E}
```

*(End definition for `\lgroup`, `\rgroup`, and `\bracevert`.)*

## 6.5 Math versions of text commands

The `\mathunderscore` here is really a text definition, so it has been put back into  
`loutenc.dtx` (by Chris, 30/04/97) and should be removed from here.

These symbols are the math versions of text commands such as `\P`, `\$`, etc.

```
\mathparagraph These math symbols are not in plain  $\TeX$ .
\mathsection 614 \DeclareMathSymbol{\mathparagraph}{\mathord}{symbols}{"7B}
\mathdollar 615 \DeclareMathSymbol{\mathsection}{\mathord}{symbols}{"78}
\mathsterling 616 \DeclareMathSymbol{\mathdollar}{\mathord}{operators}{"24}
\mathunderscore 617 \DeclareRobustCommand\mathsterling{\mathit{\mathchar"7024}}
618 \DeclareRobustCommand\mathunderscore{\kern.06em\vbox{\hrule\@width.3em}}
```

*(End definition for `\mathparagraph` and others.)*

`\mathellipsis` This is plain  $\TeX$ 's `\ldots`.

```
619 \DeclareRobustCommand\mathellipsis{\mathinner{\ldotp\ldotp\ldotp}}%
```

*(End definition for `\mathellipsis`.)*

## 6.6 Other special functions and parameters

### 6.6.1 Biggggg

```
620 \</math>
621 \<math | latexrelease>
622 \<latexrelease> \IncludeInRelease{2018/12/01}%
623 \<latexrelease>           {\Big}{Start LR-mode}%
624 \DeclareRobustCommand\big[1]{\leavevmode@ifvmode
625     {\hbox{$\left#1\vbox to8.5\p@{\right.\n@space$}}}}
626 \DeclareRobustCommand\Big[1]{\leavevmode@ifvmode
627     {\hbox{$\left#1\vbox to11.5\p@{\right.\n@space$}}}}
628 \DeclareRobustCommand\bigg[1]{\leavevmode@ifvmode
629     {\hbox{$\left#1\vbox to14.5\p@{\right.\n@space$}}}}
630 \DeclareRobustCommand\Bigg[1]{\leavevmode@ifvmode
631     {\hbox{$\left#1\vbox to17.5\p@{\right.\n@space$}}}}
632 \</math | latexrelease>
```

```

633 \latexrelease\EndIncludeInRelease
634 \latexrelease\IncludeInRelease{0000/00/00}%
635 \latexrelease{\Big}{\Start LR-mode}%
636 \latexrelease\def\big#1{{\hbox{$\left#1\ vbox to8.5\p@{\}\right.\n@space$}}}}
637 \latexrelease\def\Big#1{{\hbox{$\left#1\ vbox to11.5\p@{\}\right.\n@space$}}}}
638 \latexrelease\def\bigg#1{{\hbox{$\left#1\ vbox to14.5\p@{\}\right.\n@space$}}}}
639 \latexrelease\def\Bigg#1{{\hbox{$\left#1\ vbox to17.5\p@{\}\right.\n@space$}}}}
640 \latexrelease\EndIncludeInRelease
641 \*math)

642 \def\n@space{\null\delimiterspace\z@ \m@th}

```

## 6.6.2 The log-like functions

`\operator@font` The `\operator@font` determines the symbol font used for log-like functions.

```
643 \def\operator@font{\mathgroup\symoperators}
```

(End definition for `\operator@font`.)

## 6.6.3 Parameters

```

644 \thinmuskip=3mu
645 \medmuskip=4mu plus 2mu minus 4mu
646 \thickmuskip=5mu plus 5mu

```

This finishes the low-level setup in `fontmath.ltx`.

```
647 \math)
```

# 7 Default cfg files

We provide default `cfg` files here to ensure that on installations that search large file trees we do not pick up some strange customisation files from somewhere.

```

648 \*cfgtext | cfgmath | cfgprel)
649 %%
650 %%
651 %%
652 %% Load the standard setup:
653 %%
654 \+cfgtext\input{fonttext.ltx}
655 \+cfgmath\input{fontmath.ltx}
656 \+cfgprel\input{preload.ltx}
657 %%
658 %% Small changes could go here; see documentation in cfgguide.tex for
659 %% allowed modifications.
660 %%
661 %% In particular it is not allowed to misuse this configuration file
662 %% to modify internal LaTeX commands!
663 %%
664 %% If you use this file as the basis for configuration please change
665 %% the \ProvidesFile lines to clearly identify your modification, e.g.,
666 %%
667 \+cfgtext%% \ProvidesFile{fonttext.cfg}[2001/06/01
668 \+cfgmath%% \ProvidesFile{fontmath.cfg}[2001/06/01
669 \+cfgprel%% \ProvidesFile{preload.cfg}[2001/06/01
670 %% Customised local font setup]
671 %%

```

672 %%  
673 </cfgtext | cfgmath | cfgprel>

## File C

# preload.dtx

## 1 Overview

This file contains an number of possible settings for preloading fonts during installation of NFSS2 (which is used by L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>). It will be used to generate the following files:

preload.min	minimal subset of fonts necessary to run NFSS2
preload.ori	preload of CM fonts similar to the old <code>lfonts.tex</code>
preload.ltx	The standard selection of preloads
cmpreload.xpt	preload of CM fonts for 10pt document size
cmpreload.xip	preload of CM fonts for 11pt document size
cmpreload.xii	preload of CM fonts for 12pt document size
dcpreload.xpt	preload of DC fonts for 10pt size
dcpreload.xip	preload of DC fonts for 11pt size
dcpreload.xii	preload of DC fonts for 12pt size

These files are for installations that make use of Computer Modern fonts either old encoding (OT1) or Cork encoding (T1). The Computer Modern fonts with Cork encoding are known as DC-fonts.

Most important is `preload.ltx` which is used during format generation. You are *not* allowed to change this file.

## 2 Customization

You can customize the preloaded fonts in your L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> system by installing a file with the name `preload.cfg`. If this file exists it will be used in place of the system file `preload.ltx`. You can, for example, copy one of the files mentioned above (that can be generated from this source) to `preload.cfg`.

Or you can define completely other preloads. In that case start from `preload.min` since that contains the fonts that have to be preloaded by *\*all\** L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> systems.

Avoid using `preload.ori`, it will load so many fonts that on most installations it is nearly impossible to load other font families afterwards. This file is only generated to show what fonts have been preloaded by L<sup>A</sup>T<sub>E</sub>X 2.09.

If you normally use other fonts than Computer Modern `preload.min` might be best.

**Warning:** If you preload fonts with encodings other than the normally supported encodings you have to declare that encoding in a `fontdef.cfg` configuration file (see the documentation in the file `fontdef.dtx`). Adding an extra encoding to the format might produce non-portable documents, thus this should be avoided if possible.

## 3 Module switches for the DOCSTRIP program

The DOCSTRIP will generate the above file from this source using the following module directives:

driver	produce a documentation driver file
preload	produce a preload... file
cm	for OT1 encoded Computer Modern
dc	for T1 encoded Computer Modern
min	produce minimal subset
xpt	produce 10pt preloads
xipt	produce 11pt preloads
xipt	produce 12pt preloads
ori	produce preloads similar to old <code>lfonts.tex</code>
tex	produce <code>preload.ltx</code>

A typical DOCSTRIP command file would then have entries like:

```
generateFile{preload.min}{t}{\from{preload.dtx}{preload,min}}
```

for generating preload files.

## 4 A driver for this document

The next bit of code contains the documentation driver file for T<sub>E</sub>X, i.e., the file that will produce the documentation you are currently reading. It will be extracted from this file by the DOCSTRIP program.

```

1 <*driver>
2 \documentclass{ltxdoc}
3 %\OnlyDescription % comment out for implementation details
4 \begin{document}
5   \DocInput{preload.dtx}
6 \end{document}
7 </driver>
```

## 5 The code

We begin by loading the math extension font (cmex10) and the L<sup>A</sup>T<sub>E</sub>X line and circle fonts. It is necessary to do this explicitly since these are used by the L<sup>A</sup>T<sub>E</sub>X format. Since the internal font name contains / characters and digits we construct the name via `\csname`. These are the only fonts (!) that must be loaded in this file.

All `\DeclarePreloadSizes` can be removed or others can be added, they only influence the processing speed.

```

8 \expandafter\font\csname OMX/cmex/m/n/10\endcsname=cmex10\relax
9 \font\tenln =line10 \font\tenlnw =linew10\relax
10 \font\tenncirc=lcircle10 \font\tenncircw=lcirclew10\relax
```

The above fonts should not be touched but anything below this point here in the preload suggestions can be modified without any problems.

```

11 <-tex>%*****
12 <-tex>% Start any modification below this point **
13 <-tex>%*****
14 <-tex>
15 %%
16 %% Computer Modern Roman:
17 %%-----
```



```

18 <*ori>
19 \DeclarePreloadSizes{OT1}{cmr}{m}{n}
20     {5,6,7,8,9,10,10.95,12,14.4,17.28,20.74,24.88}
21 \DeclarePreloadSizes{OT1}{cmr}{bx}{n}{9,10,10.95,12,14.4,17.28}
22 \DeclarePreloadSizes{OT1}{cmr}{m}{sl}{10,10.95,12}
23 \DeclarePreloadSizes{OT1}{cmr}{m}{it}{7,8,9,10,10.95,12}
24 </ori>
25 <+xpt & cm> \DeclarePreloadSizes{OT1}{cmr}{m}{n}{5,7,10}
26 <+xpt & dc> \DeclarePreloadSizes{T1}{cmr}{m}{n}{5,7,10}
27 <+xipt & cm> \DeclarePreloadSizes{OT1}{cmr}{m}{n}{6,8,10.95}
28 <+xipt & dc> \DeclarePreloadSizes{T1}{cmr}{m}{n}{6,8,10.95}
29 <+xipt & cm> \DeclarePreloadSizes{OT1}{cmr}{m}{n}{6,8,12}
30 <+xipt & dc> \DeclarePreloadSizes{T1}{cmr}{m}{n}{6,8,12}
31 %%
32 %% Computer Modern Sans:
33 %%-----
34 <+ori> \DeclarePreloadSizes{OT1}{cmss}{m}{n}{10,10.95,12}
35 %%
36 %% Computer Modern Typewriter:
37 %%-----
38 <+ori> \DeclarePreloadSizes{OT1}{cmtt}{m}{n}{9,10,10.95,12}
39 %%
40 %% Computer Modern Math:
41 %%-----
42 <*ori>
43 \DeclarePreloadSizes{OML}{cmm}{m}{it}
44     {5,6,7,8,9,10,10.95,12,14.4,17.28,20.74}
45 \DeclarePreloadSizes{OMS}{cmsy}{m}{n}
46     {5,6,7,8,9,10,10.95,12,14.4,17.28,20.74}
47 </ori>

```

The math fonts are the same for both DC and CM fonts. So far there isn't an agreed on standard.

```

48 <*xpt>
49 \DeclarePreloadSizes{OML}{cmm}{m}{it}{5,7,10}
50 \DeclarePreloadSizes{OMS}{cmsy}{m}{n}{5,7,10}
51 </xpt>
52 <*xipt>
53 \DeclarePreloadSizes{OML}{cmm}{m}{it}{6,8,10.95}
54 \DeclarePreloadSizes{OMS}{cmsy}{m}{n}{6,8,10.95}
55 </xipt>
56 <*xipt>
57 \DeclarePreloadSizes{OML}{cmm}{m}{it}{6,8,12}
58 \DeclarePreloadSizes{OMS}{cmsy}{m}{n}{6,8,12}
59 </xipt>
60 %%
61 %% LaTeX symbol fonts:
62 %%-----
63 <*ori>
64 \DeclarePreloadSizes{U}{lasy}{m}{n}
65     {5,6,7,8,9,10,10.95,12,14.4,17.28,20.74}
66 </ori>
67 </preload>

```

# File D

## lftntcmd.dtx

### Abstract

The commands defined in this file `lftntcmd` are part of the kernel code for  $\text{\LaTeX 2}_{\epsilon}/\text{NFSS2}$ .

It is also meant to serve as documentation for package writers since it demonstrates how to define high-level font changing commands using a small number of creator functions.

## 1 Introduction

Font changes such as `\bfseries`, `\sffamily`, etc. are declarations; this means that their scope is delimited by the grouping structure, either by the next `\end` of some environment or by explicitly using a group, e.g., writing something like `{\bfseries...}` in the source. If you make the mistake of writing `\bfseries{...}` (thinking of `\bfseries` as a command with one argument) then the result is rather striking.

Font declarations are an artifact of the  $\text{\TeX}$  system and for several reasons it is better to avoid them on the user level whenever possible. In  $\text{\LaTeX 3}$  they will probably all be replaced by environments and by font commands taking one argument.

This file defines a creator function for such declarative font switches. This function creates commands which can be used in both math and text.

This file also defines a number of high-level commands (all starting with `\text..`) that have one argument and typeset this argument in the requested way. Thus these commands are for typesetting short pieces of text in a specific family, series or shape. These are all produced as examples of the use of a creator function which is itself also defined in this file.

Table 1 shows all these high-level commands in action. A further advantage of using these commands is that they automatically take care of any necessary italic correction on either side of their argument.

Thus, when using such commands, one does not have to worry about forgetting the italic correction when changing fonts. Only in very few situations is this additional space wrong but, for example, most typographers recommend omitting the italic correction if a small punctuation character, like a comma, directly follows the font change. Since the amount of correction required is partly a matter of taste, you can define in what situations the italic correction should be suppressed. This is done by putting the characters that should cancel a preceding italic correction in the list `\nocorrlist`.<sup>30</sup> The default definition for this list is produced by the following.

```
\newcommand \nocorrlist {,.}
```

It is best to declare the most often used characters first, because this will make the processing slightly faster. For example,

```
\emph{When using the \NFSS{} high-level commands,  
the \emph{proper} use of italic corrections is  
automatically taken care of}. Only
```

---

<sup>30</sup>Any package that changes the `\catcode` of a character inside `\nocorrlist` must then explicitly reset the list. Otherwise the changed character will no longer be recognized by the suppression algorithm.

<i>Command</i>	<i>Corresponds to</i>	<i>Action</i>
<code>\textnormal{..}</code>	<code>\normalfont</code>	Typeset argument in normal family
<code>\textrm{..}</code>	<code>\rmfamily</code>	Typeset argument in roman family
<code>\textsf{..}</code>	<code>\sffamily</code>	Typeset argument in <b>sans serif</b> family
<code>\texttt{..}</code>	<code>\ttfamily</code>	Typeset argument in <b>typewriter</b> family
<code>\textmd{..}</code>	<code>\mdseries</code>	Typeset argument in medium series
<code>\textbf{..}</code>	<code>\bfseries</code>	Typeset argument in <b>bold</b> series
<code>\textup{..}</code>	<code>\upshape</code>	Typeset argument in normal shape
<code>\textit{..}</code>	<code>\itshape</code>	Typeset argument in <i>italic</i> shape
<code>\textsl{..}</code>	<code>\slshape</code>	Typeset argument in <i>slanted</i> shape
<code>\textsc{..}</code>	<code>\scshape</code>	Typeset argument in SMALL CAPS shape
<code>\emph{..}</code>	<code>\em</code>	Typeset argument <i>emphasized</i>

Table 1: Font-change commands with arguments

The font change commands provided here all start with `\text..` to emphasize that they are for use in normal text and to be easily memorable. They automatically take care of any necessary italic correction on either side of the argument.

`\emph{sometimes}` one has to help `\LaTeX{}` by adding a `\verb=\nocorr=` command.

which results in:

*When using the NFSS high-level commands, the proper use of italic corrections is automatically taken care of. Only sometimes one has to help L<sup>A</sup>T<sub>E</sub>X by adding a `\nocorr` command.*

In contrast, the use of the declaration forms is often more appropriate when you define your own commands or environments.

```
\newenvironment{bfitemize}{\begin{itemize}\normalfont\bfseries}
                          {\end{itemize}}
\begin{bfitemize}
\item This environment produces boldface items.
\item It is defined in terms of \LaTeX's
      \texttt{itemize} environment and NFSS
      declarations.
\end{bfitemize}
```

This gives:

- **This environment produces boldface items.**
- **It is defined in terms of L<sup>A</sup>T<sub>E</sub>X's `itemize` environment and NFSS declarations.**

In addition to global customization of when to insert the italic correction, it is of course sometimes necessary to explicitly insert one with `\/`.

It is also possible to suppress the italic correction in individual instances. For this, the command `\nocorr` is provided.

The `\nocorr` must appear as the first or last token inside the braces of the argument of the `\text...` commands, at that end of the text where you wish to suppress the italic correction.

It is worth pointing out here that inserting a `\/` in places where it can have no function (i.e. anywhere except immediately after a slanted letter) is not an error—it will just be silently ignored. Unfortunately this is not true if the redefinition of `\/` in `amstex.sty` is used as this version can cause space to be removed immediately before the `\/`.

## 2 The implementation

`\DeclareTextFontCommand` This is the creator function for `\text..` commands. It gives a warning if `\foo` or `\fragfoo` is already defined.

In math mode it simply puts the font declaration and text into a box (possibly an automagically sized one).

Otherwise it first scans the text to see where `\nocorr` occurs within it. This sets the `\check@ic` commands to do what is necessary concerning the italic correction at both ends.

The algorithm for deciding whether to put in an italic correction is not very subtle: one is added whenever the newly current font is not itself positively sloped, unless the next token is a character in the ‘nocorr’ list. At the end of the text this is done after closing the group so as to check the ‘outer font’. Note that this will often result in adding an italic correction token after a character in an unsloped font; we believe (in early 2003) that this is perhaps inefficient but not dangerous.

It also now checks for empty contents of the text command and optimizes this case. Some care is also taken to check that doing dangerous things in vertical mode is avoided.

The italic correction token is added to the horizontal list before (in the list) an immediately preceding non-zero glob of glue (skip) and any non-zero penalty preceding that since, in the typical case, this puts it immediately after the last character in the preceding word.

Note that it is necessary to put in the `\aftergroup\maybe@ic` at the end of the group so that it comes after any other aftergroup tokens and immediately before the following tokens. It is also necessary to remove the `\fi` from the token list before the group ends; this is done by adding an `\expandafter` just before the closing brace.

```

1  \langle *2kernel\rangle
2  \def \DeclareTextFontCommand #1#2{%
3    \DeclareRobustCommand#1[1]{%
4      \ifmmode
5        \nfss@text{#2##1}%
6      \else
7        \hmode\bgroup
8        \text@command{##1}%
9        #2\check@icl ##1\check@icr
10       \expandafter
11       \egroup
12       \fi
13           }%
14  }
```

(End definition for `\DeclareTextFontCommand`.)

`\textrm` Now we define the `\text{family}` commands in terms of the above; `\texttt` does not  
`\textsf` look very nice!  
`\texttt` 15 `\DeclareTextFontCommand{\textrm}{\rmfamily}`  
`\textnormal` 16 `\DeclareTextFontCommand{\textsf}{\sffamily}`  
 17 `\DeclareTextFontCommand{\texttt}{\ttfamily}`  
 18 `\DeclareTextFontCommand{\textnormal}{\normalfont}`

(End definition for `\textrm` and others.)

`\textbf` For the series attribute:  
`\textmd` 19 `\DeclareTextFontCommand{\textbf}{\bfseries}`  
 20 `\DeclareTextFontCommand{\textmd}{\mdseries}`

(End definition for `\textbf` and `\textmd`.)

`\textit` And for the shapes:  
`\textsl` 21 `\DeclareTextFontCommand{\textit}{\itshape}`  
`\textsc` 22 `\DeclareTextFontCommand{\textsl}{\slshape}`  
`\textup` 23 `\DeclareTextFontCommand{\textsc}{\scshape}`  
 24 `\DeclareTextFontCommand{\textup}{\upshape}`

(End definition for `\textit` and others.)

`textulc`  
`textsw` 25 `</2ekernel>`  
`textssc` 26 `<*2ekernel | latexrelease>`  
 27 `<latexrelease>\IncludeInRelease{2020/02/02}%`  
 28 `<latexrelease>{\textulc}{Additional text commands}%`  
 29 `\DeclareTextFontCommand{\textulc}{\ulcshape}`  
 30 `\DeclareTextFontCommand{\textsw}{\swshape}`  
 31 `\DeclareTextFontCommand{\textssc}{\sscshape}`  
 32 `</2ekernel | latexrelease>`  
 33 `<latexrelease>\EndIncludeInRelease`  
 34 `<latexrelease>\IncludeInRelease{0000/00/00}%`  
 35 `<latexrelease>{\textulc}{Additional text commands}%`  
 36 `<latexrelease>`  
 37 `<latexrelease>\let\textulc\@undefined`  
 38 `<latexrelease>\let\textsw\@undefined`  
 39 `<latexrelease>\let\textssc\@undefined`  
 40 `<latexrelease>\EndIncludeInRelease`  
 41 `<*2ekernel>`

(End definition for `textulc`, `textsw`, and `textssc`.)

`\emph` Finally we have the `\em` font change declaration of L<sup>A</sup>T<sub>E</sub>X. The corresponding definition with argument is

42 `\DeclareTextFontCommand{\emph}{\em}`

(End definition for `\emph`.)

`\nocorr` This is just a label, so it does nothing; it should also be unexpandable.

43 `\let \nocorr \relax`

(End definition for `\nocorr`.)

`\check@ic1` We define these defaults in case some error causes them to be expanded at the wrong  
`\check@icr` time.

```
44 \let \check@ic1 \@empty
45 \let \check@icr \@empty
```

(End definition for `\check@ic1` and `\check@icr`.)

`\text@command` This checks for a `\nocorr` as the first token in its argument and also for one in any other  
`\check@nocorr@` position not protected within braces (the latter is treated as if it were at the end of the argument).

Is this the correct action in the ‘empty’ case? It is efficient but typographically it is, strictly, incorrect!

```
46 \def \text@command #1{%
47   \edef \reserved@a {\unexpanded{#1}}%
48   \ifx \reserved@a \@empty
49     \let \check@ic1 \@empty
50     \let \check@icr \@empty
51   \else
```

`\space` is a reserved word in L<sup>A</sup>T<sub>E</sub>X or actually already in plain T<sub>E</sub>X. If somebody really redefines it so many things will break that I don’t see any reason to make this routine here slower than necessary.

```
52 %   \def \reserved@b { }%
53 %   \ifx \reserved@a \reserved@b
54   \ifx \reserved@a \space
55     \let \check@ic1 \@empty
56     \let \check@icr \@empty
57   \else
58     \check@nocorr@ #1\nocorr\@nil
59   \fi
60 \fi
61 }
62 \def \check@nocorr@ #1#2\nocorr#3\@nil {%
```

The two checks are initialised here to their values in the normal case.

```
63 \let \check@ic1 \maybe@ic
64 \def \check@icr {\ifvmode \else \aftergroup \maybe@ic \fi}%
65 \def \reserved@a {\nocorr}%
66 \def \reserved@b {#1}%
67 \def \reserved@c {#3}%
68 \ifx \reserved@a \reserved@b
69   \ifx \reserved@c \@empty
```

In this case there is a `\nocorr` at the start but not at the end, so `\check@ic1` should be empty.

```
70   \let \check@ic1 \@empty
71 \else
```

Otherwise there is a `\nocorr` both at the start and elsewhere, so no italic corrections should be added.

```
72   \let \check@ic1 \@empty
73   \let \check@icr \@empty
74 \fi
```

```

75 \else
76 \ifx \reserved@c \@empty

```

In this case there is no `\nocorr` anywhere, so we need to check for an italic correction at both the beginning and the end. This has been set up as the default so no code is needed here.

```

77 \else

```

In this case there is no `\nocorr` at the start but there is one elsewhere, so no `\aftergroup` is needed.

```

78 \let \check@icr \@empty
79 \fi
80 \fi
81 }

```

*(End definition for \text@command and \check@nocorr@.)*

`\ifmaybe@ic` Switch used solely within `\maybe@ic` not interfering with other switches.

```

82 \newif\ifmaybe@ic

```

*(End definition for \ifmaybe@ic.)*

`\maybe@ic` These macros implement the italic correction.

```

\maybe@ic@
83 \def \maybe@ic {\futurelet \@let@token \maybe@ic@}
84 \def \maybe@ic@ {%

```

We first check to see if the current font is positively sloped. (But do not forget the message Rainer sent about an upright font with non-zero slope! Or is this an urban myth?) It has been suggested that this should test against a small positive value, but what?

```

85 \ifdim \fontdimen\@ne\font>\z@
86 \else
87 \maybe@ictrue

```

It would be possible, but probably not worthwhile, to continue the forward scan beyond any closing braces.

```

88 \expandafter \@tfor \expandafter \reserved@a \expandafter : \expandafter = %
89 \nocorrlist

```

We have to hide the `\@let@token` in the macro `\t@st@ic` rather than testing it directly in the loop since it might be `\let` to a `\fi` or `\else`, which would result in chaos.

```

90 \do \t@st@ic

```

Frank thinks that the next bit is inefficient if done after the second change. Chris thinks that most all of this is inefficient for the commonest cases: but that is the price of a cleverer algorithm. It is certainly needed to deal with the use of `\nolinebreak`.

```

91 \ifmaybe@ic \sw@slant \fi
92 \fi
93 }

```

*(End definition for \maybe@ic and \maybe@ic@.)*

`\t@st@ic` The next token in the input stream is stored in `\@let@token` via a `\let`, the current token from `\nocorrlist` is stored via `\def` in `\reserved@a`. To compare them we have to fiddle around a bit.

If the only things to check were characters then this could be done via an `\if` thus their catcodes would not matter; but this will not work whilst `\futurelet` is used above.

```

94 \def \t@st@ic {%
95   \expandafter\let\expandafter\reserved@b\expandafter=\reserved@a\relax
96   \ifx\reserved@b\@let@token

```

If they are the same we record the fact and jump out of the loop.

```

97     \maybe@icfalse
98     \@break@tfor
99   \fi
100 }

```

(End definition for `\t@st@ic`.)

`\sw@slant` The definition of the mysterious `\sw@slant` command is as follows.  
`\fix@penalty`

```

101 \def \sw@slant {%

```

It is surely correct to put in an italic correction when there is no skip. If the last thing on the list is actually a zero skip (including things whose dimension part is zero, such as `\hfill`), or anything other than a character, then the italic correction will have no effect.

In order to work correctly with unbreakable spaces from `~` (and other common forms of line-breaking control) we also move back across a penalty before the glue.

```

102   \ifdim \lastskip=\z@
103     \fix@penalty
104   \else
105     \skip@ \lastskip
106     \unskip
107     \fix@penalty
108     \hskip \skip@
109   \fi
110 }

```

The above code means: “If there is a non-zero space just before the current position (`\ifdim...`) save the amount of that space (`\skip@\lastskip`), remove it (`\unskip`), then do a similar thing if there is a penalty just before the skip, and finally put the space back in.”

Since zero glue cannot be distinguished in this context from no glue, we dare not put in an `\hskip` in this case as this may produce an unwanted breakpoint. This is not satisfactory.

The penalty before the glue is handled similarly, with the same caveats concerning the zero case. Is this the first recorded use of `\unpenalty` in standard L<sup>A</sup>T<sub>E</sub>X code?

```

111 \def \fix@penalty {%
112   \ifnum \lastpenalty=\z@
113     @@italiccorr
114   \else
115     \count@ \lastpenalty
116     \unpenalty
117     @@italiccorr

```



```

118     \penalty \count@
119     \fi
120 }

```

(End definition for `\sw@slant` and `\fix@penalty`.)

**\nocorrlist** This holds the list of characters that should prevent italic correction. They should be ordered by decreasing frequency of use. If any such character is made active later on one needs to redefine the list so that the active character becomes part of it.

```

121 \def \nocorrlist {,}

```

(End definition for `\nocorrlist`.)

**\nfss@text** This command will by default behave like a L<sup>A</sup>T<sub>E</sub>X `\mbox` but may be redefined by packages such as `amstext.sty` to be a bit cleverer.

```

122 \ifx \nfss@text\undefined
123   \def \nfss@text {\leavevmode\hbox}
124 \fi

```

(End definition for `\nfss@text`.)

**\DeclareOldFontCommand** This is the function used to create declarative font-changing commands that can also be used to change alphabets in math-mode.

Usage: `\DeclareOldFontCommand \fn{<font-change decls>} <math-alphabet>`

Here `\fn` is the font-declaration command being defined, `<font-change decls>` is the declaration it will expand to in text-mode, and `<math-alphabet>` is the (single) math alphabet specifier which is to be used in math-mode.

It does not care whether the command being defined already exists but it does give a warning if it redefines anything.

Here are some typical examples of its use in conjunction with more basic NFSS2 font commands.

```

\DeclareOldFontCommand{\rm}{\normalfont\rmfamily}{\mathrm}
\DeclareOldFontCommand{\sf}{\normalfont\sffamily}{\mathsf}
\DeclareOldFontCommand{\tt}{\normalfont\ttfamily}{\mathtt}

```

```

125 \def \DeclareOldFontCommand #1#2#3{%
126   \DeclareRobustCommand #1{\@fontswitch {#2}{#3}}%
127 }

```

(End definition for `\DeclareOldFontCommand`.)

**\@fontswitch** **\@math@egroup** These two commands actually do the necessary tests and declarative font- or alphabet-changing.

```

\@math@egroup
\@math@egroup
128 \def \@fontswitch #1#2{%
129   \ifmmode
130     \let \math@bgroup \relax
131     \def \math@egroup {\let \math@bgroup \@math@bgroup
132                       \let \math@egroup \@math@egroup}%

```

We need to have a `\relax` in the following line in case the `#2` is something like `\mathsf` grabbing the next token as an argument. For this reason the code also uses explicit arguments again (see pr/1275).

```

133     #2\relax
134   \else
135     #1%
136   \fi
137 }
138 \let \@@math@bgroup \math@bgroup
139 \let \@@math@egroup \math@egroup

(End definition for \@fontswitch, \@@math@egroup, and \@@math@egroup.)
These commands are available only in the preamble.
140 \@onlypreamble \DeclareTextFontCommand
141 \@onlypreamble \DeclareOldFontCommand

```

### 3 Initialization

```

\normalsize This is defined to produce an error.
142 \def\normalsize{%
143   \@latex@error {The font size command \protect\normalsize\space
144                 is not defined:\MessageBreak
145                 there is probably something wrong with
146                 the class file}\@eha
147 }
148 \</2ekernel>

(End definition for \normalsize.)

```

## File E

# ltextcomp.dtx

This file contains the implementation for accessing the glyphs provided by the TS1 encoding (Text Companion Encoding). This is now offered as part of the kernel and so the `textcomp` package which used to provide the definitions is now mainly needed for compatibility reasons (and doesn't do much any more).

```
1 <*2ekernel | latexrelease>
2 <latexrelease>\NewModuleRelease{2020/02/02}{ltextcomp}
3 <latexrelease>                                {Text Companion symbols}
```

`\oldstylenums`  
`\legacyoldstylenums`

Preserve the old definition of `\oldstylenums` under a different name.

This macro implements old style numerals but only works if we assume that the standard math fonts are used. Thus it needs changing in case other math encodings are used.

```
4 \DeclareRobustCommand\legacyoldstylenums[1]{%
5   \begingroup
```

Provide spacing using the interword space of the current font.

```
6   \spaceskip\fontdimen\tw@\font
```

Then switch to the math italic font. We don't change the current value of `\f@series` which means that you can use bold numerals if `\bfseries` is in force. As family we use `\rmdefault` which means that this only works if there exist an OML encoded version of that font or rather a corresponding `.fd` file (which is the case for standard L<sup>A</sup>T<sub>E</sub>X fonts even though they only contain substitutions).

```
7   \usefont{OML}{\rmdefault}{\f@series}{it}%
8   \mathgroup\symletters #1%
9   \endgroup
10 }
```

And here is the improved one that adjusts depending on surroundings.

```
11 \DeclareRobustCommand\oldstylenums[1]{%
12   \begingroup
13   \ifmmode
14     \mathgroup\symletters #1%
15   \else
```

The `\CheckEncodingSubset` is discussed below.

```
16   \CheckEncodingSubset\@use@text@encoding{TS1}{\tc@oldstylesubst2{{#1}}}%
17   \fi
18   \endgroup
19 }
```

The helper to select the substitution if needed.

```
20 \def\tc@oldstylesubst#1{%
21   \tc@errorwarn
22     {Oldstyle digits unavailable for
23     family \f@family.\MessageBreak
24     Default oldstyle digits used instead}\@eha
25   \bgroup
26   \expand@font@defaults
```

The substitution defaults are provided in the file `fonttext.ltx`.

```

27      \ifx\f@family\rmdef@ult
28      \fontfamily\rmsubstdefault
29      \else\ifx\f@family\sfsdef@ult
30      \fontfamily\sfsbstdefault
31      \else\ifx\f@family\ttdef@ult
32      \fontfamily\ttsbstdefault
33      \else
34      \fontfamily\textcompsubstdefault
35      \fi\fi\fi
36      \fontencoding{TS1}\selectfont#1%
37  \egroup
38  }

```

(End definition for `\oldstylenums` and `\legacyoldstylenums`.)

`\textcompsubstdefault` Here is the default for the “unknown” case:

```

39  \def\textcompsubstdefault{\rmsubstdefault}

```

(End definition for `\textcompsubstdefault`.)

`\DeclareEncodingSubset` The declaration takes 3 mandatory arguments: an *encoding* for which a subsetting is wanted (currently always `TS1`, and most likely forever), the *font family* for which we declare the subset and finally the *subset* number (between 0 (all of the encoding is supported) and 9 many glyphs are missing).

For `TS1` the numbers have been chosen in a way that most fonts can be fairly correctly categorized, but the default settings are always conservative, that is they may claim that less glyphs are supported than there actually are.

As these days many font families are set up to end in `-LF` (lining figures), `-OsF` (oldstyle figures), etc. the declaration supports a shortcut: if the *font family* name ends in `-*` then the star gets replaced by these common ending, e.g.,

```
\DeclareEncodingSubset{TS1}{Alegreya-*}{2}
```

is the same as writing

```

\DeclareEncodingSubset{TS1}{Alegreya-LF}{2}
\DeclareEncodingSubset{TS1}{Alegreya-OsF}{2}
\DeclareEncodingSubset{TS1}{Alegreya-TLF}{2}
\DeclareEncodingSubset{TS1}{Alegreya-TOf}{2}

```

If only some are needed then one can define them individually but in many cases all four are wanted, hence the shortcut.

The coding of the declaration has no error checking as it is mostly for internal use.

```

40  \def\DeclareEncodingSubset#1#2{%
41    \DeclareEncodingSubset@aux{#1}#2*\DeclareEncodingSubset@aux
42  }
43  \def\DeclareEncodingSubset@aux#1#2*#3\DeclareEncodingSubset@aux#4{%

```

if #3 is empty then there was no star, otherwise we define all four variants.

```

44 \expandafter\ifx\expandafter X\detokenize{#3}X%
45 \DeclareEncodingSubset{#1}{#2}{#4}%
46 \else
47 \DeclareEncodingSubset{#1}{#2LF}{#4}%
48 \DeclareEncodingSubset{#1}{#2TLF}{#4}%
49 \DeclareEncodingSubset{#1}{#2OsF}{#4}%
50 \DeclareEncodingSubset{#1}{#2T0sF}{#4}%
51 \fi
52 }

```

The subset info is stored in a command with the name `\family:subset` so if that already exists we change otherwise declare a subset.

```

53 \def\DeclareEncodingSubset#1#2#3{%
54 \ifundefined{#1:#2}%
55 {\font@info{Setting #2 sub-encoding to #1/#3}}%
56 {\font@info{Changing #2 sub-encoding to #1/#3}}%
57 \namedef{#1:#2}{#3}}

```

Any reason to allow those in the middle of documents?

```

58 \onlypreamble\DeclareEncodingSubset
59 \onlypreamble\DeclareEncodingSubset@aux
60 \onlypreamble\DeclareEncodingSubset

```

(End definition for `\DeclareEncodingSubset`.)

`\CheckEncodingSubset` The command `\CheckEncodingSubset` will check if the current font family has the right encoding subset to typeset a certain command. It takes five arguments as follows: first argument is either `\UseTextSymbol`, `\UseTextAccent` depending on whether or not the symbol is a text symbol or a text accent.

The second argument is the encoding from which this symbol should be fetched.

The third argument is either a fake accessor command or an error message. the code in that argument (if ever executed) receives two arguments: #2 and #5 of `\CheckEncodingSubset`.

Argument four is the subset encoding id to test against: if this value is higher than the subset id of the current font family then we typeset the symbol, i.e., execute `#1{#2}#5` otherwise it runs `#3#5`, e.g., to produce an error message or fake the glyph somehow.

Argument five is the symbol or accent command that is being checked.

For usage examples see definitions below.

```

61 \def\CheckEncodingSubset#1#2#3#4#5{%
62 \ifnum #4>%
63 \expandafter\ifx\csname #2:\f@family\endcsname\relax
64 0\csname #2:\f@family\endcsname
65 \else
66 \csname #2:\f@family\endcsname
67 \fi
68 \relax
69 \expandafter\@firstoftwo
70 \else
71 \expandafter\@secondoftwo
72 \fi
73 {#1{#2}}{#3}%
74 #5%
75 }

```

(End definition for `\CheckEncodingSubset`.)

To set up the glyphs for the subsets we need a number helpers.

`\tc@errorwarn` To we produce errors, warnings, or only info in the transcripts if glyphs require substitutions? By default it is “info” only. With the `textcomp` package that can be changed.

```
76 \def\tc@errorwarn#1#2{\@latex@info{#1}}
```

(End definition for `\tc@errorwarn`.)

`\tc@subst`

```
77 \def\tc@subst#1{%
78   \tc@errorwarn
79   {Symbol \string#1 not provided by\MessageBreak
80    font family \f@family\space
81    in TS1 encoding.\MessageBreak Default family used instead}\@eha
82   \bgroup
83     \expand@font@defaults
84     \ifx\f@family\rmdef@ult
85       \fontfamily\rmsubstdefault
86     \else\ifx\f@family\sfddef@ult
87       \fontfamily\sfsbstdefault
88     \else\ifx\f@family\ttdef@ult
89       \fontfamily\ttsbstdefault
90     \else
91       \fontfamily\textcompsbstdefault
92     \fi\fi\fi
```

Whatever default was chosen, we claim now (locally hopefully) that it can handle all slots (even if not true) to avoid looping in certain situations, e.g., when something was set up incorrectly.

```
93   \@namedef{TS1:\f@family}{0}%
94   \selectfont#1%
95   \egroup
96 }
```

(End definition for `\tc@subst`.)

`\tc@fake@euro` `\tc@fake@euro` is an example of a “fake” definition to use in arg #3 of the command `\CheckEncodingSubset` when a symbol is not available in a certain font family. Here we produce a poor man’s Euro symbol by combining a “C” with a “=”.

```
97 \def\tc@fake@euro#1{%
98   \leavevmode
99   \@font@info{Faking \noexpand#1for font family
100               \f@family\MessageBreak in TS1 encoding}%
101   \valign{##\cr
102     \vfil\hbox to 0.07em{\dimen@f@size\p@
103                           \math@fontsfalse
104                           \fontsize{.7\dimen@}\z@\selectfont=\hss}%
105     \vfil\cr%
106     \hbox{C}\crrcr
107   }%
108 }
```

(End definition for `\tc@fake@euro`.)

`\tc@check@symbol` These are two abbreviations that we use below to check symbols and accents in TS1.  
`\tc@check@accent` Only there to save some space, e.g., we can then write

```
DeclareTextCommandDefault{\textcurrency}{\tc@check@symbol3\textcurrency}
```

to ensure that `\textcurrency` is only typeset if the current font has a TS1 subset id of less than 3. Otherwise `\tc@error` is called telling the user that for this font family `\textcurrency` is not available.

```
109 \def\tc@check@symbol{\CheckEncodingSubset\UseTextSymbol{TS1}\tc@subst}
```

Accents have been made an error in the `textcomp` package when not available. Now that we provide the functionality in the kernel we avoid the error by swapping in a T1 accent if the TS1 accent is not available.

```
110 %\def\tc@check@accent{\CheckEncodingSubset\UseTextAccent{TS1}\tc@error}
```

```
111 \def\tc@check@accent#1{\CheckEncodingSubset\UseTextAccent
112                               {TS1}{\tc@swap@accent#1}}
```

```
113 \def\tc@swap@accent#1#2{\UseTextAccent{T1}#1}
```

*(End definition for `\tc@check@symbol` and `\tc@check@accent`.)*

## 1 Sub-encodings

Here are the default definitions for the TS1 symbols. First those that we assume are always available if a font implements TS1.

```
114 \DeclareTextSymbolDefault{\textdollar}{TS1}
```

```
115 \UndeclareTextCommand{\textdollar}{OT1} % don't use the OT1 def any longer
```

```
116 \DeclareTextSymbolDefault{\textsterling}{TS1}
```

```
117 \UndeclareTextCommand{\textsterling}{OT1}% don't use the OT1 def any longer
```

```
118 \DeclareTextSymbolDefault{\textperthousand}{TS1}
```

```
119 \UndeclareTextCommand{\textperthousand}{T1} % don't use the T1 def
```

Using `\UndeclareTextCommand` above is enough only if the encoding definition files are not reloaded afterwards. In the past that happened if `fontenc` was used in the document preamble (not any longer). So in some sense it is better to fully remove them from the encoding files, but for rollbacks it is easier to keep them in for now.

These are the standard `itemize` and footnote symbols originally taken from OMS and now from TS1:

```
120 \DeclareTextSymbolDefault{\textasteriskcentered}{TS1}
```

```
121 \DeclareTextSymbolDefault{\textbullet}{TS1}
```

```
122 \DeclareTextSymbolDefault{\textdaggerdbl}{TS1}
```

```
123 \DeclareTextSymbolDefault{\textdagger}{TS1}
```

```
124 \DeclareTextSymbolDefault{\textparagraph}{TS1}
```

```
125 \DeclareTextSymbolDefault{\textperiodcentered}{TS1}
```

```
126 \DeclareTextSymbolDefault{\textsection}{TS1}
```

And here are the other TS1 glyphs that are implemented by every font (or nearly every—a few are commented out and moved to sub-encoding 9, because they aren't around in some fonts.

```
127 %%\DeclareTextSymbolDefault{\textbardbl}{TS1} % subst in sub-enc 9 above
```

```
128 \DeclareTextSymbolDefault{\textbrokenbar}{TS1}
```

```
129 %%\DeclareTextSymbolDefault{\textcelsius}{TS1} % subst in sub-enc 9 above
```

```
130 \DeclareTextSymbolDefault{\textcent}{TS1}
```

```

131 \DeclareTextSymbolDefault{\textcopyright}{TS1}
132 \DeclareTextSymbolDefault{\textdegree}{TS1}
133 \DeclareTextSymbolDefault{\textdiv}{TS1}
134 \DeclareTextSymbolDefault{\textlnot}{TS1}
135 \DeclareTextSymbolDefault{\textonehalf}{TS1}
136 \DeclareTextSymbolDefault{\textonequarter}{TS1}
137 %%\DeclareTextSymbolDefault{\textonesuperior}{TS1} % subst in sub-enc 9 above
138 \DeclareTextSymbolDefault{\textordfeminine}{TS1}
139 \DeclareTextSymbolDefault{\textordmasculine}{TS1}
140 \DeclareTextSymbolDefault{\textpm}{TS1}
141 \DeclareTextSymbolDefault{\textquotesingle}{TS1}
142 \DeclareTextSymbolDefault{\textquotestraightbase}{TS1}
143 \DeclareTextSymbolDefault{\textquotestraightdblbase}{TS1}
144 \DeclareTextSymbolDefault{\textregistered}{TS1}
145 %%\DeclareTextSymbolDefault{\textthreemarkersemdash}{TS1} % subst in sub-enc 9 above
146 \DeclareTextSymbolDefault{\textthreequarters}{TS1}
147 %%\DeclareTextSymbolDefault{\textthreesuperior}{TS1} % subst in sub-enc 9 above
148 \DeclareTextSymbolDefault{\texttimes}{TS1}
149 \DeclareTextSymbolDefault{\texttrademark}{TS1}
150 %%\DeclareTextSymbolDefault{\texttwelveudash}{TS1} % subst in sub-enc 9 above
151 %%\DeclareTextSymbolDefault{\texttwosuperior}{TS1} % subst in sub-enc 9 above
152 \DeclareTextSymbolDefault{\textyen}{TS1}

153 \DeclareTextSymbolDefault{\textcapitalcompwordmark}{TS1}
154 \DeclareTextSymbolDefault{\textascendercompwordmark}{TS1}

```

In the following sections the remaining default definitions are ordered by sub-encoding in which they are become **unavailable**, i.e., they are not provided in the sub-encoding with that number and all sub-encodings with higher numbers.

Thus the symbols that are available in sub-encoding  $x$  are the symbols above (always available) and the symbols listed as becoming unavailable in sub-encodings  $x + 1$  and higher.

## 1.1 Unavailable in sub-encoding 1 and higher (drop symbols not working in Latin Modern)

The `\textcircled` is available but the glyph is simply too small so we keep using the OMS glyph.

```

155 \DeclareTextCommandDefault{\textcircled}
156   {\CheckEncodingSubset\UseTextAccent{TS1}{\UseTextAccent{OMS}}1\textcircled}

```

## 1.2 Unavailable in sub-encoding 2 (majority of new OTF fonts via autoinst) and higher

```

157 \DeclareTextCommandDefault{\t}
158   {\CheckEncodingSubset\UseTextAccent{TS1}{\UseTextAccent{OML}}2\t}

```

Capital accents are really only very seldom implemented, so from sub-encoding 2 onwards we use the normal T1 accents if they are asked for in the document.

In Unicode engines we don't implement them at all but always use the basic accents instead. whether that works or not really depends on the font, something like `\X` usually comes out wrong in Unicode engines.

```

159 \ifx\Umathcode\@undefined
160   \DeclareTextCommandDefault{\capitalacutec}

```



```

161         {\tc@check@accent{\'}2\capitalacute}
162 \DeclareTextCommandDefault{\capitalbreve}
163         {\tc@check@accent{\u}2\capitalbreve}
164 \DeclareTextCommandDefault{\capitalcaron}
165         {\tc@check@accent{\v}2\capitalcaron}
166 \DeclareTextCommandDefault{\capitalcedilla}
167         {\tc@check@accent{\c}2\capitalcedilla}
168 \DeclareTextCommandDefault{\capitalcircumflex}
169         {\tc@check@accent{\^}2\capitalcircumflex}
170 \DeclareTextCommandDefault{\capitaldieresis}
171         {\tc@check@accent{\"}2\capitaldieresis}
172 \DeclareTextCommandDefault{\capitaldotaccent}
173         {\tc@check@accent{\.}2\capitaldotaccent}
174 \DeclareTextCommandDefault{\capitalgrave}
175         {\tc@check@accent{\`}2\capitalgrave}
176 \DeclareTextCommandDefault{\capitalhungarumlaut}
177         {\tc@check@accent{\H}2\capitalhungarumlaut}
178 \DeclareTextCommandDefault{\capitalmacron}
179         {\tc@check@accent{\=}2\capitalmacron}
180 \DeclareTextCommandDefault{\capitalogonek}
181         {\tc@check@accent{\k}2\capitalogonek}
182 \DeclareTextCommandDefault{\capitalring}
183         {\tc@check@accent{\r}2\capitalring}
184 \DeclareTextCommandDefault{\capitaltie}
185         {\tc@check@accent{\t}2\capitaltie}
186 \DeclareTextCommandDefault{\capitaltilde}
187         {\tc@check@accent{\~}2\capitaltilde}

```

For \newtie and \capitalnewtie this is actually wrong, they should pick up the accent from the substitution font (not done yet).

```

188 \DeclareTextCommandDefault{\newtie}
189         {\tc@check@accent{\t}2\newtie}
190 \DeclareTextCommandDefault{\capitalnewtie}
191         {\tc@check@accent{\t}2\capitalnewtie}

```

In Unicode engines we just execute the simple accents:

```

192 \else
193 \DeclareTextCommandDefault\capitalacute{\@tabacckludge'}
194 \DeclareTextCommandDefault\capitalbreve{\u}
195 \DeclareTextCommandDefault\capitalcaron{\v}
196 \DeclareTextCommandDefault\capitalcedilla{\c}
197 \DeclareTextCommandDefault\capitalcircumflex{\^}
198 \DeclareTextCommandDefault\capitaldieresis{\"}
199 \DeclareTextCommandDefault\capitaldotaccent{\.}
200 \DeclareTextCommandDefault\capitalgrave{\@tabacckludge`}
201 \DeclareTextCommandDefault\capitalhungarumlaut{\H}
202 \DeclareTextCommandDefault\capitalmacron{\@tabacckludge=}
203 \DeclareTextCommandDefault\capitalnewtie{\t}
204 \DeclareTextCommandDefault\capitalogonek{\k}
205 \DeclareTextCommandDefault\capitalring{\r}
206 \DeclareTextCommandDefault\capitaltie{\t}
207 \DeclareTextCommandDefault\capitaltilde{\~}
208 \DeclareTextCommandDefault\newtie{\t}
209 \fi

```

The next two symbols exist in some fonts (faked?), but we ignore that to keep the subsets reasonable compact and most important linear.

```
210 \DeclareTextCommandDefault{\textlbrackdbl}
211      {\tc@check@symbol2\textlbrackdbl}
212 \DeclareTextCommandDefault{\textrbrackdbl}
213      {\tc@check@symbol2\textrbrackdbl}
```

Old style numerals are again in some fonts but using -OsF, etc. is the better approach to get them, so we claim they aren't in sub-encoding 2 as that's true for most fonts.

```
214 \DeclareTextCommandDefault{\texteightoldstyle}
215      {\tc@check@symbol2\texteightoldstyle}
216 \DeclareTextCommandDefault{\textfiveoldstyle}
217      {\tc@check@symbol2\textfiveoldstyle}
218 \DeclareTextCommandDefault{\textfouroldstyle}
219      {\tc@check@symbol2\textfouroldstyle}
220 \DeclareTextCommandDefault{\textnineoldstyle}
221      {\tc@check@symbol2\textnineoldstyle}
222 \DeclareTextCommandDefault{\textoneoldstyle}
223      {\tc@check@symbol2\textoneoldstyle}
224 \DeclareTextCommandDefault{\textsevenoldstyle}
225      {\tc@check@symbol2\textsevenoldstyle}
226 \DeclareTextCommandDefault{\textsixoldstyle}
227      {\tc@check@symbol2\textsixoldstyle}
228 \DeclareTextCommandDefault{\textthreeoldstyle}
229      {\tc@check@symbol2\textthreeoldstyle}
230 \DeclareTextCommandDefault{\texttwooldstyle}
231      {\tc@check@symbol2\texttwooldstyle}
232 \DeclareTextCommandDefault{\textzerooldstyle}
233      {\tc@check@symbol2\textzerooldstyle}
```

The next set of glyphs is special to T<sub>E</sub>X fonts (and available with a few older PS fonts supported through virtual fonts), but not any longer in the majority of fonts provided through autost, so we pretend there aren't available in sub-encoding 2 and below.

```
234 \DeclareTextCommandDefault{\textacutedbl}
235      {\tc@check@symbol2\textacutedbl}
236 \DeclareTextCommandDefault{\textasciiacute}
237      {\tc@check@symbol2\textasciiacute}
238 \DeclareTextCommandDefault{\textasciibreve}
239      {\tc@check@symbol2\textasciibreve}
240 \DeclareTextCommandDefault{\textasciicaron}
241      {\tc@check@symbol2\textasciicaron}
242 \DeclareTextCommandDefault{\textasciidieresis}
243      {\tc@check@symbol2\textasciidieresis}
244 \DeclareTextCommandDefault{\textasciigrave}
245      {\tc@check@symbol2\textasciigrave}
246 \DeclareTextCommandDefault{\textasciimacron}
247      {\tc@check@symbol2\textasciimacron}
248 \DeclareTextCommandDefault{\textgravedbl}
249      {\tc@check@symbol2\textgravedbl}
250 \DeclareTextCommandDefault{\texttildelow}
251      {\tc@check@symbol2\texttildelow}
```

Finally those below are only available in CM-based fonts but in no font that has its origin outside of the T<sub>E</sub>X world.

```
252 \DeclareTextCommandDefault{\textbaht}
253      {\tc@check@symbol2\textbaht}
```

```

254 \DeclareTextCommandDefault{\textbigcircle}
255       {\tc@check@symbol2\textbigcircle}
256 \DeclareTextCommandDefault{\textborn}
257       {\tc@check@symbol2\textborn}
258 \DeclareTextCommandDefault{\textcentoldstyle}
259       {\tc@check@symbol2\textcentoldstyle}
260 \DeclareTextCommandDefault{\textcircledP}
261       {\tc@check@symbol2\textcircledP}
262 \DeclareTextCommandDefault{\textcopyleft}
263       {\tc@check@symbol2\textcopyleft}
264 \DeclareTextCommandDefault{\textdblhyphenchar}
265       {\tc@check@symbol2\textdblhyphenchar}
266 \DeclareTextCommandDefault{\textdblhyphen}
267       {\tc@check@symbol2\textdblhyphen}
268 \DeclareTextCommandDefault{\textdied}
269       {\tc@check@symbol2\textdied}
270 \DeclareTextCommandDefault{\textdiscount}
271       {\tc@check@symbol2\textdiscount}
272 \DeclareTextCommandDefault{\textdivorced}
273       {\tc@check@symbol2\textdivorced}
274 \DeclareTextCommandDefault{\textdollaroldstyle}
275       {\tc@check@symbol2\textdollaroldstyle}
276 \DeclareTextCommandDefault{\textguarani}
277       {\tc@check@symbol2\textguarani}
278 \DeclareTextCommandDefault{\textleaf}
279       {\tc@check@symbol2\textleaf}
280 \DeclareTextCommandDefault{\textlquill}
281       {\tc@check@symbol2\textlquill}
282 \DeclareTextCommandDefault{\textmarried}
283       {\tc@check@symbol2\textmarried}
284 \DeclareTextCommandDefault{\textmho}
285       {\tc@check@symbol2\textmho}
286 \DeclareTextCommandDefault{\textmusicalnote}
287       {\tc@check@symbol2\textmusicalnote}
288 \DeclareTextCommandDefault{\textnaira}
289       {\tc@check@symbol2\textnaira}
290 \DeclareTextCommandDefault{\textopenbullet}
291       {\tc@check@symbol2\textopenbullet}
292 \DeclareTextCommandDefault{\textpeso}
293       {\tc@check@symbol2\textpeso}
294 \DeclareTextCommandDefault{\textpilcrow}
295       {\tc@check@symbol2\textpilcrow}
296 \DeclareTextCommandDefault{\textrecipe}
297       {\tc@check@symbol2\textrecipe}
298 \DeclareTextCommandDefault{\textreferencemark}
299       {\tc@check@symbol2\textreferencemark}
300 \DeclareTextCommandDefault{\textrquill}
301       {\tc@check@symbol2\textrquill}
302 \DeclareTextCommandDefault{\textservicemark}
303       {\tc@check@symbol2\textservicemark}
304 \DeclareTextCommandDefault{\textsurd}
305       {\tc@check@symbol2\textsurd}

```

The `\textpertenthousand` also belongs in this group but here we have a choice: in T1 there is a definition for `\textpertenthousand` making the symbol up from % and

\char 24 (twice) but in many fonts that char doesn't exist and the slot is reused for random ligatures. So better not use it because often it is wrong. But pointing to TS1 is also not great as only a few fonts have it as a real symbol, so we get a substitution to CM or LM.

Alternatively we could just state that the symbol is unavailable in those fonts. For now I substitute.

```
306 \DeclareTextCommandDefault{\textpertenthousand}
307         {\tc@check@symbol12\textpertenthousand}
308 \UndeclareTextCommand{\textpertenthousand}{T1}
```

### 1.3 Unavailable in sub-encoding 3 and higher

Sub-encoding 2 is the one where we loose many symbols. In the higher-numbered sub-encodings we see only a few dropped additionally.

```
309 \DeclareTextCommandDefault{\textlangle}
310         {\tc@check@symbol13\textlangle}
311 \DeclareTextCommandDefault{\textrangle}
312         {\tc@check@symbol13\textrangle}
```

### 1.4 Unavailable in sub-encoding 4 and higher

```
313 \DeclareTextCommandDefault{\textcolonmonetary}
314         {\tc@check@symbol14\textcolonmonetary}
315 \DeclareTextCommandDefault{\textdong}
316         {\tc@check@symbol14\textdong}
317 \DeclareTextCommandDefault{\textdownarrow}
318         {\tc@check@symbol14\textdownarrow}
319 \DeclareTextCommandDefault{\textleftarrow}
320         {\tc@check@symbol14\textleftarrow}
321 \DeclareTextCommandDefault{\textlira}
322         {\tc@check@symbol14\textlira}
323 \DeclareTextCommandDefault{\textrightarrow}
324         {\tc@check@symbol14\textrightarrow}
325 \DeclareTextCommandDefault{\textuparrow}
326         {\tc@check@symbol14\textuparrow}
327 \DeclareTextCommandDefault{\textwon}
328         {\tc@check@symbol14\textwon}
```

### 1.5 Unavailable in sub-encoding 5 (most older PS fonts) and higher

Most older PS fonts (supported in T<sub>E</sub>X since the early nineties when virtual fonts became available) are sorted under this sub-encoding. But in reality, many of them don't have all glyphs that should be available in sub-encoding 5. Instead they show little squares, i.e., they produce “tofu” if you are unlucky.

But the coverage is so random that it is impossible to sort them properly and if we tried to ensure that they only typeset those glyphs that are really always available, we would have to put them all into sub-encoding 9; so putting them into 5 is really a compromise.

Modern fonts usually don't typeset a tofu character if a glyph is missing. They are therefore only classified as sub-encoding 5 if they really support its glyph set completely.

```
329 \DeclareTextCommandDefault{\textestimated}
330         {\tc@check@symbol15\textestimated}
```

```

331 \DeclareTextCommandDefault{\textnumero}
332      {\tc@check@symbol5\textnumero}

```

## 1.6 Unavailable in sub-encoding 6 and higher

```

333 \DeclareTextCommandDefault{\textflorin}
334      {\tc@check@symbol6\textflorin}
335 \DeclareTextCommandDefault{\textcurrency}
336      {\tc@check@symbol6\textcurrency}

```

## 1.7 Unavailable in sub-encoding 7 and higher

```

337 \DeclareTextCommandDefault{\textfractionsolidus}
338      {\tc@check@symbol7\textfractionsolidus}
339 \DeclareTextCommandDefault{\textohm}
340      {\tc@check@symbol7\textohm}
341 \DeclareTextCommandDefault{\textmu}
342      {\tc@check@symbol7\textmu}
343 \DeclareTextCommandDefault{\textminus}
344      {\tc@check@symbol7\textminus}

```

## 1.8 Unavailable in sub-encoding 8 and higher

```

345 \DeclareTextCommandDefault{\textblank}
346      {\tc@check@symbol8\textblank}
347 \DeclareTextCommandDefault{\textinterrobangdown}
348      {\tc@check@symbol8\textinterrobangdown}
349 \DeclareTextCommandDefault{\textinterrobang}
350      {\tc@check@symbol8\textinterrobang}

```

Fonts with this sub-encoding don't have a Euro symbol, but instead of substituting we fake it.

```

351 \DeclareTextCommandDefault{\texteuro}
352      {\CheckEncodingSubset\UseTextSymbol{TS1}\tc@fake@euro{8}\texteuro}

```

## 1.9 Unavailable in Sub-encoding 9 (most missing)

```

353 \DeclareTextCommandDefault{\textcelsius}
354      {\tc@check@symbol9\textcelsius}
355 \DeclareTextCommandDefault{\textonesuperior}
356      {\tc@check@symbol9\textonesuperior}
357 \DeclareTextCommandDefault{\textthreequartersemdash}
358      {\tc@check@symbol9\textthreequartersemdash}
359 \DeclareTextCommandDefault{\textthreesuperior}
360      {\tc@check@symbol9\textthreesuperior}
361 \DeclareTextCommandDefault{\texttwelveudash}
362      {\tc@check@symbol9\texttwelveudash}
363 \DeclareTextCommandDefault{\texttwosuperior}
364      {\tc@check@symbol9\texttwosuperior}
365 \DeclareTextCommandDefault{\textbardbl}
366      {\tc@check@symbol9\textbardbl}

```

## 2 Unicode engine specials

If we are using a unicode engine we handle some glyphs differently, so this here are the definitions for the Unicode encoding (overwriting the defaults above).

```

367 \ifx \Umathcode\undefined \else

```

This set should be taken from TS1 encoding even if it means you get it from the default font for that encoding.

```

368 %\DeclareTextSymbol{\textcopyleft}{TS1}{171}
369 %\DeclareTextSymbol{\textdblhyphen}{TS1}{45}
370 %\DeclareTextSymbol{\textdblhyphenchar}{TS1}{127}
371 %\DeclareTextSymbol{\textquotestraightbase}{TS1}{13}
372 %\DeclareTextSymbol{\textquotestraightdblbase}{TS1}{18}
373 %\DeclareTextSymbol{\textleaf}{TS1}{108}
374 %\DeclareTextSymbol{\texttwelvewardash}{TS1}{21}
375 %\DeclareTextSymbol{\textthreequartersemdash}{TS1}{22}

```

If oldstyle numerals are asked for we just use `\oldstylenums`.

```

376 \DeclareTextCommand{\textzerooldstyle} \UnicodeEncodingName{\oldstylenums{0}}
377 \DeclareTextCommand{\textoneoldstyle} \UnicodeEncodingName{\oldstylenums{1}}
378 \DeclareTextCommand{\texttwooldstyle} \UnicodeEncodingName{\oldstylenums{2}}
379 \DeclareTextCommand{\textthreeoldstyle} \UnicodeEncodingName{\oldstylenums{3}}
380 \DeclareTextCommand{\textfouroldstyle} \UnicodeEncodingName{\oldstylenums{4}}
381 \DeclareTextCommand{\textfiveoldstyle} \UnicodeEncodingName{\oldstylenums{5}}
382 \DeclareTextCommand{\textsixoldstyle} \UnicodeEncodingName{\oldstylenums{6}}
383 \DeclareTextCommand{\textsevenoldstyle} \UnicodeEncodingName{\oldstylenums{7}}
384 \DeclareTextCommand{\texteightoldstyle} \UnicodeEncodingName{\oldstylenums{8}}
385 \DeclareTextCommand{\textnineoldstyle} \UnicodeEncodingName{\oldstylenums{9}}

```

These have Unicode slots so this should be integrated into TU explicitly

```

386 \DeclareTextSymbol{\textpilcrow} \UnicodeEncodingName{"00B6}
387 \DeclareTextSymbol{\textborn} \UnicodeEncodingName{"002A}
388 \DeclareTextSymbol{\textdied} \UnicodeEncodingName{"2020}
389 \DeclareTextSymbol{\textlbrackdbl} \UnicodeEncodingName{"27E6}
390 \DeclareTextSymbol{\textrbrackdbl} \UnicodeEncodingName{"27E7}
391 \DeclareTextSymbol{\textguarani} \UnicodeEncodingName{"20B2}

```

We could make `\textcentoldstyle` and `\textdollaroldstyle` point to dollar and cent in the Unicode encoding

```

392 %\DeclareTextSymbol{\textcentoldstyle} \UnicodeEncodingName{"00A2}
393 %\DeclareTextSymbol{\textdollaroldstyle} \UnicodeEncodingName{"0024}

```

but I think it is better to pick them up from TS1 even if that usually means LMR fonts

```

394 \DeclareTextSymbol{\textdollaroldstyle}{TS1}{138}
395 \DeclareTextSymbol{\textcentoldstyle} {TS1}{139}

```

```

396 \fi % --- END of Unicode engines specials

```

### 3 Font family sub-encodings setup

We declare the subsets for a good number of fonts in the kernel ...

But first the default for anything that is not declared. We use 9 which is most likely much too conservative, but with the advantage that we aren't getting missing glyphs (or at least that this is very unlikely). For nearly all font in the T<sub>E</sub>X Live distribution of 2019 "correct" classifications are given below, so that this default is only used for new font families, and over time the right classifications can be added here too.

```

397 \DeclareEncodingSubset{TS1}{?}{9}

```

This first block contains the fonts that have been already supported by the `textcomp` package way back, i.e., the font families that have  $\TeX$  support since the mid-nineties.

```

398 \DeclareEncodingSubset{TS1}{ccr}      {0}
399 \DeclareEncodingSubset{TS1}{cmbr}     {0}
400 \DeclareEncodingSubset{TS1}{cmr}      {0}
401 \DeclareEncodingSubset{TS1}{cmss}     {0}
402 \DeclareEncodingSubset{TS1}{cmtl}     {0}
403 \DeclareEncodingSubset{TS1}{cmtt}     {0}
404 \DeclareEncodingSubset{TS1}{cmvtt}    {0}
405 \DeclareEncodingSubset{TS1}{pxr}      {0}
406 \DeclareEncodingSubset{TS1}{pxss}     {0}
407 \DeclareEncodingSubset{TS1}{pxtt}     {0}
408 \DeclareEncodingSubset{TS1}{qag}      {0}
409 \DeclareEncodingSubset{TS1}{qbk}      {0}
410 \DeclareEncodingSubset{TS1}{qcr}      {0}
411 \DeclareEncodingSubset{TS1}{qcs}      {0}
412 \DeclareEncodingSubset{TS1}{qhvc}     {0}
413 \DeclareEncodingSubset{TS1}{qhv}      {0}
414 \DeclareEncodingSubset{TS1}{qpl}      {0}
415 \DeclareEncodingSubset{TS1}{qtm}      {0}
416 \DeclareEncodingSubset{TS1}{qzc}      {0}
417 \DeclareEncodingSubset{TS1}{txr}      {0}
418 \DeclareEncodingSubset{TS1}{txss}     {0}
419 \DeclareEncodingSubset{TS1}{txtt}     {0}

420 \DeclareEncodingSubset{TS1}{lmr}      {1}
421 \DeclareEncodingSubset{TS1}{lmdh}     {1}
422 \DeclareEncodingSubset{TS1}{lmss}     {1}
423 \DeclareEncodingSubset{TS1}{lmssq}    {1}
424 \DeclareEncodingSubset{TS1}{lmvtt}    {1}
425 \DeclareEncodingSubset{TS1}{lmtt}     {1} % missing TM, SM and
426                                     % pertenthousand for some reason

427 \DeclareEncodingSubset{TS1}{ptmx}     {2}
428 \DeclareEncodingSubset{TS1}{ptmj}     {2}
429 \DeclareEncodingSubset{TS1}{ul8}      {2}

430 \DeclareEncodingSubset{TS1}{bch} {5} % tofu for blank, ohm
431 \DeclareEncodingSubset{TS1}{futj} {5} % tofu for blank, interrobang/down, ohm
432 \DeclareEncodingSubset{TS1}{futs} {5} % tofu for blank, ohm
433 \DeclareEncodingSubset{TS1}{futsx} {5} % probably (currently broken distrib)
434 \DeclareEncodingSubset{TS1}{pag} {5} % tofu for blank, interrobang/down, ohm
435 \DeclareEncodingSubset{TS1}{pbk} {5} % tofu for blank, interrobang/down, ohm
436 \DeclareEncodingSubset{TS1}{pcr} {5} % tofu for blank, interrobang/down, ohm
437 \DeclareEncodingSubset{TS1}{phv} {5} % tofu for blank, interrobang/down, ohm
438 \DeclareEncodingSubset{TS1}{pnc} {5} % tofu for blank, interrobang/down, ohm
439 \DeclareEncodingSubset{TS1}{pplj} {5} % tofu for blank
440 \DeclareEncodingSubset{TS1}{pplx} {5} % tofu for blank
441 \DeclareEncodingSubset{TS1}{ppl} {5} % tofu for blank interrobang/down
442 \DeclareEncodingSubset{TS1}{ptm} {5} % tofu for blank, interrobang/down, ohm
443 \DeclareEncodingSubset{TS1}{pzc} {5} % tofu for blank, interrobang/down, ohm
444 \DeclareEncodingSubset{TS1}{ul9} {5} % tofu for blank, interrobang/down, ohm

445 \DeclareEncodingSubset{TS1}{dayroms} {6} % tofu for blank, interrobang/down, ohm
446 \DeclareEncodingSubset{TS1}{dayrom} {6} % tofu for blank, interrobang/down, ohm
447 \DeclareEncodingSubset{TS1}{augie} {8} % really only missing euro

```

```

448 \DeclareEncodingSubset{TS1}{put} {8}
449 \DeclareEncodingSubset{TS1}{uag} {8} % probably (currently broken distrib)
450 \DeclareEncodingSubset{TS1}{ugq} {8}
451 \DeclareEncodingSubset{TS1}{zi4} {9}

```

LucidaBright (sold through TUG) probably not quite correct, I guess as I have the older fonts ...

```

452 \DeclareEncodingSubset{TS1}{hls} {5}
453 \DeclareEncodingSubset{TS1}{hlst} {5}
454 \DeclareEncodingSubset{TS1}{hlct} {5}
455 \DeclareEncodingSubset{TS1}{hlh} {5}
456 \DeclareEncodingSubset{TS1}{hlx} {8}
457 \DeclareEncodingSubset{TS1}{hlce} {8}
458 \DeclareEncodingSubset{TS1}{hlcn} {8}
459 \DeclareEncodingSubset{TS1}{hlcw} {8}
460 \DeclareEncodingSubset{TS1}{hlcf} {8}

```

Below are the newer fonts that have support files for L<sup>A</sup>T<sub>E</sub>X. With very few exceptions the classifications are done so that all characters are correctly produced (either being available in the font or substituted).

There are a few fonts that contain “tofu” squares in places (instead of a real glyph) and in a few cases some really seldom needed chars are unavailable, i.e., produce missing glyphs (to avoid that a large number of available chars are unnecessarily substituted).

```

461 \DeclareEncodingSubset{TS1}{lato-*} {0} % with a bunch of tofu inside
462 \DeclareEncodingSubset{TS1}{opensans-*} {0} % with a bunch of tofu inside
463 \DeclareEncodingSubset{TS1}{cantarell-*} {0} % with a bunch of tofu inside
464 \DeclareEncodingSubset{TS1}{fbb-*} {0} % missing centoldstyle
465 \DeclareEncodingSubset{TS1}{tli} {1} % with lots of tofu inside

466 \DeclareEncodingSubset{TS1}{Alegreya-*} {2}
467 \DeclareEncodingSubset{TS1}{AlegreyaSans-*} {2}
468 \DeclareEncodingSubset{TS1}{DejaVuSans-TLF} {2}
469 \DeclareEncodingSubset{TS1}{DejaVuSansCondensed-TLF} {2}
470 \DeclareEncodingSubset{TS1}{DejaVuSansMono-TLF} {2}
471 \DeclareEncodingSubset{TS1}{EBGaramond-*} {2}
472 \DeclareEncodingSubset{TS1}{Tempora-TLF} {2}
473 \DeclareEncodingSubset{TS1}{Tempora-T0sF} {2}

474 \DeclareEncodingSubset{TS1}{Arimo-TLF} {3}
475 \DeclareEncodingSubset{TS1}{Carlito-*} {3}
476 \DeclareEncodingSubset{TS1}{FiraSans-*} {3}
477 \DeclareEncodingSubset{TS1}{IBMPlexSans-TLF} {3}
478 \DeclareEncodingSubset{TS1}{Merriweather-0sF} {3}
479 \DeclareEncodingSubset{TS1}{Montserrat-*} {3}
480 \DeclareEncodingSubset{TS1}{MontserratAlternates-*} {3}
481 \DeclareEncodingSubset{TS1}{SourceCodePro-TLF} {3}
482 \DeclareEncodingSubset{TS1}{SourceCodePro-T0sF} {3}
483 \DeclareEncodingSubset{TS1}{SourceSansPro-*} {3}
484 \DeclareEncodingSubset{TS1}{SourceSerifPro-*} {3}
485 \DeclareEncodingSubset{TS1}{Tinos-TLF} {3}

486 \DeclareEncodingSubset{TS1}{AccanthisADFStdNoThree-LF} {4}
487 \DeclareEncodingSubset{TS1}{Cabin-TLF} {4}
488 \DeclareEncodingSubset{TS1}{Caladea-TLF} {4}
489 \DeclareEncodingSubset{TS1}{Chivo-*} {4}

```



```

490 \DeclareEncodingSubset{TS1}{ClearSans-TLF} {4}
491 \DeclareEncodingSubset{TS1}{Coelacanth-LF} {4}
492 \DeclareEncodingSubset{TS1}{CrimsonPro-*} {4}
493 \DeclareEncodingSubset{TS1}{FiraMono-TLF} {4}
494 \DeclareEncodingSubset{TS1}{FiraMono-T0sF} {4}
495 \DeclareEncodingSubset{TS1}{Go-TLF} {4}
496 \DeclareEncodingSubset{TS1}{GoMono-TLF} {4}
497 \DeclareEncodingSubset{TS1}{InriaSans-*} {4}
498 \DeclareEncodingSubset{TS1}{InriaSerif-*} {4}
499 \DeclareEncodingSubset{TS1}{LibertinusSans-*} {4}
500 \DeclareEncodingSubset{TS1}{LibertinusSerif-*} {4}
501 \DeclareEncodingSubset{TS1}{LibreBodoni-TLF} {4}
502 \DeclareEncodingSubset{TS1}{LibreFranklin-TLF} {4}
503 \DeclareEncodingSubset{TS1}{LinguisticsPro-LF} {4}
504 \DeclareEncodingSubset{TS1}{LinguisticsPro-0sF} {4}
505 \DeclareEncodingSubset{TS1}{LinuxBiolumT-*} {4}
506 \DeclareEncodingSubset{TS1}{LinuxLibertineT-*} {4}
507 \DeclareEncodingSubset{TS1}{MerriweatherSans-0sF} {4}
508 \DeclareEncodingSubset{TS1}{MintSpirit-*} {4}
509 \DeclareEncodingSubset{TS1}{MintSpiritNoTwo-*} {4}
510 \DeclareEncodingSubset{TS1}{PTMono-TLF} {4}
511 \DeclareEncodingSubset{TS1}{PTSans-TLF} {4}
512 \DeclareEncodingSubset{TS1}{PTSansCaption-TLF} {4}
513 \DeclareEncodingSubset{TS1}{PTSansNarrow-TLF} {4}
514 \DeclareEncodingSubset{TS1}{PTSerif-TLF} {4}
515 \DeclareEncodingSubset{TS1}{PTSerifCaption-TLF} {4}
516 \DeclareEncodingSubset{TS1}{Raleway-TLF} {4}
517 \DeclareEncodingSubset{TS1}{Raleway-T0sF} {4}
518 \DeclareEncodingSubset{TS1}{Roboto-*} {4}
519 \DeclareEncodingSubset{TS1}{RobotoMono-TLF} {4}
520 \DeclareEncodingSubset{TS1}{RobotoSlab-TLF} {4}
521 \DeclareEncodingSubset{TS1}{Rosario-*} {4}
522 \DeclareEncodingSubset{TS1}{SticksTooText-*} {4}
523 \DeclareEncodingSubset{TS1}{UniversalisADFSd-LF} {4}

524 \DeclareEncodingSubset{TS1}{Almendra-0sF} {5}
525 \DeclareEncodingSubset{TS1}{Baskervaldx-*} {5}
526 \DeclareEncodingSubset{TS1}{BaskervilleF-*} {5}
527 \DeclareEncodingSubset{TS1}{Bitter-TLF} {5}
528 \DeclareEncodingSubset{TS1}{Cinzel-LF} {5}
529 \DeclareEncodingSubset{TS1}{CinzelDecorative-LF} {5}
530 \DeclareEncodingSubset{TS1}{DejaVuSerif-TLF} {5}
531 \DeclareEncodingSubset{TS1}{DejaVuSerifCondensed-TLF} {5}
532 \DeclareEncodingSubset{TS1}{GilliusADF-LF} {5}
533 \DeclareEncodingSubset{TS1}{GilliusADFCd-LF} {5}
534 \DeclareEncodingSubset{TS1}{GilliusADFNoTwo-LF} {5}
535 \DeclareEncodingSubset{TS1}{GilliusADFNoTwoCond-LF} {5}
536 \DeclareEncodingSubset{TS1}{LobsterTwo-LF} {5}
537 \DeclareEncodingSubset{TS1}{OldStandard-TLF} {5}
538 \DeclareEncodingSubset{TS1}{PlayfairDisplay-TLF} {5}
539 \DeclareEncodingSubset{TS1}{PlayfairDisplay-T0sF} {5}
540 \DeclareEncodingSubset{TS1}{TheanoDidot-TLF} {5}
541 \DeclareEncodingSubset{TS1}{TheanoDidot-T0sF} {5}
542 \DeclareEncodingSubset{TS1}{TheanoModern-TLF} {5}
543 \DeclareEncodingSubset{TS1}{TheanoModern-T0sF} {5}

```

```

544 \DeclareEncodingSubset{TS1}{TheanoOldStyle-TLF}      {5}
545 \DeclareEncodingSubset{TS1}{TheanoOldStyle-T0sF}     {5}

546 \DeclareEncodingSubset{TS1}{Crimson-TLF}             {6}
547 \DeclareEncodingSubset{TS1}{IBMPlexMono-TLF}         {6}
548 \DeclareEncodingSubset{TS1}{IBMPlexSerif-TLF}        {6}
549 \DeclareEncodingSubset{TS1}{LibertinusMono-TLF}      {6}
550 \DeclareEncodingSubset{TS1}{LibertinusSerifDisplay-LF}{6}
551 \DeclareEncodingSubset{TS1}{LinuxLibertineDisplayT-*} {6}
552 \DeclareEncodingSubset{TS1}{LinuxLibertineMonoT-LF}  {6}
553 \DeclareEncodingSubset{TS1}{LinuxLibertineMonoT-TLF} {6}
554 \DeclareEncodingSubset{TS1}{Overlock-LF}             {6}

555 \DeclareEncodingSubset{TS1}{CormorantGaramond-*}     {7}
556 \DeclareEncodingSubset{TS1}{Heuristica-TLF}         {7}
557 \DeclareEncodingSubset{TS1}{Heuristica-T0sF}        {7}
558 \DeclareEncodingSubset{TS1}{IMFELLEnglish-TLF}      {7}
559 \DeclareEncodingSubset{TS1}{LibreBaskerville-TLF}    {7}
560 \DeclareEncodingSubset{TS1}{LibreCaslon-*}           {7}
561 \DeclareEncodingSubset{TS1}{Marcellus-LF}            {7}
562 \DeclareEncodingSubset{TS1}{NotoSans-*}              {7}
563 \DeclareEncodingSubset{TS1}{NotoSansMono-TLF}        {7}
564 \DeclareEncodingSubset{TS1}{NotoSansMono-T0sF}      {7}
565 \DeclareEncodingSubset{TS1}{NotoSerif-*}             {7}
566 \DeclareEncodingSubset{TS1}{Quattrocento-TLF}       {7}
567 \DeclareEncodingSubset{TS1}{QuattrocentoSans-TLF}   {7}
568 \DeclareEncodingSubset{TS1}{XCharter-TLF}           {7}
569 \DeclareEncodingSubset{TS1}{XCharter-T0sF}          {7}
570 \DeclareEncodingSubset{TS1}{erewhon-*}              {7}
571 \DeclareEncodingSubset{TS1}{ComicNeue-TLF}           {7}
572 \DeclareEncodingSubset{TS1}{ComicNeueAngular-TLF}   {7}
573 \DeclareEncodingSubset{TS1}{Forum-LF}               {7} % the superiors are missing
574 \DeclareEncodingSubset{TS1}{Cochineal-*}            {8}
575 \DeclareEncodingSubset{TS1}{AlgolRevived-TLF}       {9}

```

## 4 Legacy symbol support for lists and footnote symbols

`\UseLegacyTextSymbols`

```

576 \def\UseLegacyTextSymbols{%
577   \DeclareTextSymbolDefault{\textasteriskcentered}{OMS}%
578   \DeclareTextSymbolDefault{\textbardbl}{OMS}%
579   \DeclareTextSymbolDefault{\textbullet}{OMS}%
580   \DeclareTextSymbolDefault{\textdaggerdbl}{OMS}%
581   \DeclareTextSymbolDefault{\textdagger}{OMS}%
582   \DeclareTextSymbolDefault{\textparagraph}{OMS}%
583   \DeclareTextSymbolDefault{\textperiodcentered}{OMS}%
584   \DeclareTextSymbolDefault{\textsection}{OMS}%
585   \UndeclareTextCommand{\textsection}{T1}%
586   \expandafter\let\csname oldstylenums \expandafter\endcsname
587     \csname legacyoldstylenums \endcsname
588 }

```

(End definition for `\UseLegacyTextSymbols`.)

`\textlegacyasteriskcentered` Here are new names for the legacy symbols that L<sup>A</sup>T<sub>E</sub>X used to pick up from the OMS encoded fonts (and used for itemize lists or footnote symbols).

`\textlegacybardbl` We go the roundabout way via separate OMS declarations so that

`\textlegacybullet` `\renewcommand\textbullet{\textlegacybullet}`

`\textlegacydaggerdbl` doesn't produce an endless loop.

`\textlegacydagger`

`\textlegacyparagraph`

`\textlegacyperiodcentered`

`\textlegacysection`

```
589 \DeclareTextSymbol{\textlegacyasteriskcentered}{OMS}{3} % "03
590 \DeclareTextSymbol{\textlegacybardbl}{OMS}{107} % "6B
591 \DeclareTextSymbol{\textlegacybullet}{OMS}{15} % "0F
592 \DeclareTextSymbol{\textlegacydaggerdbl}{OMS}{122} % "7A
593 \DeclareTextSymbol{\textlegacydagger}{OMS}{121} % "79
594 \DeclareTextSymbol{\textlegacyparagraph}{OMS}{123} % "7B
595 \DeclareTextSymbol{\textlegacyperiodcentered}{OMS}{1} % "01
596 \DeclareTextSymbol{\textlegacysection}{OMS}{120} % "78
```

```
597 \DeclareTextSymbolDefault{\textlegacyasteriskcentered}{OMS}
598 \DeclareTextSymbolDefault{\textlegacybardbl}{OMS}
599 \DeclareTextSymbolDefault{\textlegacybullet}{OMS}
600 \DeclareTextSymbolDefault{\textlegacydaggerdbl}{OMS}
601 \DeclareTextSymbolDefault{\textlegacydagger}{OMS}
602 \DeclareTextSymbolDefault{\textlegacyparagraph}{OMS}
603 \DeclareTextSymbolDefault{\textlegacyperiodcentered}{OMS}
604 \DeclareTextSymbolDefault{\textlegacysection}{OMS}
```

(End definition for `\textlegacyasteriskcentered` and others.)

Supporting rollback ...

```
605 </2ekernel | latexrelease>
606 <latexrelease>
607 <latexrelease>\IncludeInRelease{0000/00/00}%
608 <latexrelease> {ltxtextcomp}{\Undefined text companion symbols}%
609 <latexrelease>
610 <latexrelease>\DeclareRobustCommand\oldstylenums[1]{%
611 <latexrelease> \begingroup
612 <latexrelease> \spaceskip\fontdimen\tw@font
613 <latexrelease> \usefont{OML}{\rmdefault}{\f@series}{it}%
614 <latexrelease> \mathgroup\symletters #1%
615 <latexrelease> \endgroup
616 <latexrelease>}
617 <latexrelease>\let\legacyoldstylenums\@undefined
618 <latexrelease>\def\textcompsubstdefault{cmr}
619 <latexrelease>
620 <latexrelease>\let\DeclareEncodingSubset\@undefined
621 <latexrelease>\let\CheckEncodingSubset\@undefined
622 <latexrelease>
623 <latexrelease>\DeclareTextSymbolDefault{\textdollar}{OT1}
624 <latexrelease>\DeclareTextSymbolDefault{\textsterling}{OT1}
625 <latexrelease>\DeclareTextCommand{\textdollar}{OT1}{\hmode\bgroup
626 <latexrelease> \ifdim \fontdimen\@ne\font >\z@
627 <latexrelease> \slshape
628 <latexrelease> \else
629 <latexrelease> \upshape
630 <latexrelease> \fi
```

```

631 <latexrelease> \char'{$\egroup}
632 <latexrelease>\DeclareTextCommand{\textsterling}{OT1}{\hmode@bgroup
633 <latexrelease> \ifdim \fontdimen\@ne\font >\z@
634 <latexrelease> \itshape
635 <latexrelease> \else
636 <latexrelease> \fontshape{ui}\selectfont
637 <latexrelease> \fi
638 <latexrelease> \char'{$\egroup}
639 <latexrelease>\DeclareTextCommand{\textperthousand}{T1}
640 <latexrelease> {\%\char 24 }
641 <latexrelease>
642 <latexrelease>\DeclareTextSymbolDefault{\textasteriskcentered}{OMS}
643 <latexrelease>\DeclareTextSymbolDefault{\textbullet}{OMS}
644 <latexrelease>\DeclareTextSymbolDefault{\textdaggerdbl}{OMS}
645 <latexrelease>\DeclareTextSymbolDefault{\textdagger}{OMS}
646 <latexrelease>\DeclareTextSymbolDefault{\textparagraph}{OMS}
647 <latexrelease>\DeclareTextSymbolDefault{\textperiodcentered}{OMS}
648 <latexrelease>\DeclareTextSymbolDefault{\textsection}{OMS}
649 <latexrelease>
650 <latexrelease>\DeclareTextSymbolDefault{\textbardbl}{OMS}
651 <latexrelease>\let\textbrokenbar\@undefined
652 <latexrelease>\let\textcelsius\@undefined
653 <latexrelease>\let\textcent\@undefined
654 <latexrelease>\DeclareTextCommandDefault{\textcopyright}
655 <latexrelease> {\textcircled{c}}
656 <latexrelease>\let\textdegree\@undefined
657 <latexrelease>\let\textdiv\@undefined
658 <latexrelease>\let\textlnot\@undefined
659 <latexrelease>\let\textonehalf\@undefined
660 <latexrelease>\let\textonequarter\@undefined
661 <latexrelease>\let\textonesuperior\@undefined
662 <latexrelease>\DeclareTextCommandDefault{\textordfeminine}
663 <latexrelease> {\textsuperscript{a}}
664 <latexrelease>\DeclareTextCommandDefault{\textordmasculine}
665 <latexrelease> {\textsuperscript{o}}
666 <latexrelease>\let\textpm\@undefined
667 <latexrelease>\let\textquotesingle\@undefined
668 <latexrelease>\let\textquotestraightbase\@undefined
669 <latexrelease>\let\textquotestraightdblbase\@undefined
670 <latexrelease>\DeclareTextCommandDefault{\textregistered}
671 <latexrelease> {\textcircled{%
672 <latexrelease> \check@mathfonts\fontsize\sf@size\z@
673 <latexrelease> \math@fontsfalse\selectfont R}}
674 <latexrelease>\let\textthreequartersemdash\@undefined
675 <latexrelease>\let\textthreequarters\@undefined
676 <latexrelease>\let\textthreesuperior\@undefined
677 <latexrelease>\let\texttimes\@undefined
678 <latexrelease>\DeclareTextCommandDefault{\texttrademark}
679 <latexrelease> {\textsuperscript{TM}}
680 <latexrelease>\let\texttwelveudash\@undefined
681 <latexrelease>\let\texttwosuperior\@undefined
682 <latexrelease>\let\textyen\@undefined
683 <latexrelease>
684 <latexrelease>\let\textcapitalcompwordmark\@undefined

```

```

685 <latexrelease>\let\textascendercompwordmark\@undefined
686 <latexrelease>
687 <latexrelease>\DeclareTextAccentDefault{\textcircled}{OMS}
688 <latexrelease>\DeclareTextAccentDefault{\t}{OML}
689 <latexrelease>
690 <latexrelease>\let\capitalacute\@undefined
691 <latexrelease>\let\capitalbreve\@undefined
692 <latexrelease>\let\capitalcaron\@undefined
693 <latexrelease>\let\capitalcedilla\@undefined
694 <latexrelease>\let\capitalcircumflex\@undefined
695 <latexrelease>\let\capitaldieresis\@undefined
696 <latexrelease>\let\capitaldotaccent\@undefined
697 <latexrelease>\let\capitalgrave\@undefined
698 <latexrelease>\let\capitalhungarumlaut\@undefined
699 <latexrelease>\let\capitalmacron\@undefined
700 <latexrelease>\let\capitalnewtie\@undefined
701 <latexrelease>\let\capitalogonek\@undefined
702 <latexrelease>\let\capitalring\@undefined
703 <latexrelease>\let\capitaltie\@undefined
704 <latexrelease>\let\capitaltilde\@undefined
705 <latexrelease>\let\newtie\@undefined
706 <latexrelease>
707 <latexrelease>\let\textlbrackdbl\@undefined
708 <latexrelease>\let\textrrackdbl\@undefined
709 <latexrelease>
710 <latexrelease>\let\texteightoldstyle\@undefined
711 <latexrelease>\let\textfiveoldstyle\@undefined
712 <latexrelease>\let\textfouroldstyle\@undefined
713 <latexrelease>\let\textnineoldstyle\@undefined
714 <latexrelease>\let\textoneoldstyle\@undefined
715 <latexrelease>\let\textsevenoldstyle\@undefined
716 <latexrelease>\let\textsixoldstyle\@undefined
717 <latexrelease>\let\textthreeoldstyle\@undefined
718 <latexrelease>\let\texttwooldstyle\@undefined
719 <latexrelease>\let\textzerooldstyle\@undefined
720 <latexrelease>
721 <latexrelease>\let\textacutedbl\@undefined
722 <latexrelease>\let\textasciicute\@undefined
723 <latexrelease>\let\textasciibreve\@undefined
724 <latexrelease>\let\textasciicaron\@undefined
725 <latexrelease>\let\textasciidieresis\@undefined
726 <latexrelease>\let\textasciigrave\@undefined
727 <latexrelease>\let\textasciimacron\@undefined
728 <latexrelease>\let\textgravedbl\@undefined
729 <latexrelease>\let\texttildelow\@undefined
730 <latexrelease>
731 <latexrelease>\let\textbaht\@undefined
732 <latexrelease>\let\textbigcircle\@undefined
733 <latexrelease>\let\textborn\@undefined
734 <latexrelease>\let\textcentoldstyle\@undefined
735 <latexrelease>\let\textcircledP\@undefined
736 <latexrelease>\let\textcopyleft\@undefined
737 <latexrelease>\let\textdblhyphenchar\@undefined
738 <latexrelease>\let\textdblhyphen\@undefined

```

```

739 <latexrelease>\let\textdied\@undefined
740 <latexrelease>\let\textdiscount\@undefined
741 <latexrelease>\let\textdivorced\@undefined
742 <latexrelease>\let\textdollaroldstyle\@undefined
743 <latexrelease>\let\textguarani\@undefined
744 <latexrelease>\let\textleaf\@undefined
745 <latexrelease>\let\textlquill\@undefined
746 <latexrelease>\let\textmarried\@undefined
747 <latexrelease>\let\textmho\@undefined
748 <latexrelease>\let\textmusicalnote\@undefined
749 <latexrelease>\let\textnaira\@undefined
750 <latexrelease>\let\textopenbullet\@undefined
751 <latexrelease>\let\textpeso\@undefined
752 <latexrelease>\let\textpilcrow\@undefined
753 <latexrelease>\let\textrecipe\@undefined
754 <latexrelease>\let\textreferencemark\@undefined
755 <latexrelease>\let\texttrquill\@undefined
756 <latexrelease>\let\textservicemark\@undefined
757 <latexrelease>\let\textsurd\@undefined
758 <latexrelease>
759 <latexrelease>\DeclareTextCommand{\textpertenthousand}{T1}
760 <latexrelease>          {\%\char 24\char 24 }
761 <latexrelease>
762 <latexrelease>\let\textlangle\@undefined
763 <latexrelease>\let\textrangle\@undefined
764 <latexrelease>
765 <latexrelease>\let\textcolonmonetary\@undefined
766 <latexrelease>\let\textdong\@undefined
767 <latexrelease>\let\textdownarrow\@undefined
768 <latexrelease>\let\textleftarrow\@undefined
769 <latexrelease>\let\textlira\@undefined
770 <latexrelease>\let\textrightarrow\@undefined
771 <latexrelease>\let\textuparrow\@undefined
772 <latexrelease>\let\textwon\@undefined
773 <latexrelease>
774 <latexrelease>\let\textestimated\@undefined
775 <latexrelease>\let\textnumero\@undefined
776 <latexrelease>
777 <latexrelease>\let\textflorin\@undefined
778 <latexrelease>\let\textcurrency\@undefined
779 <latexrelease>
780 <latexrelease>\let\textfractionsolidus\@undefined
781 <latexrelease>\let\textohm\@undefined
782 <latexrelease>\let\textmu\@undefined
783 <latexrelease>\let\textminus\@undefined
784 <latexrelease>
785 <latexrelease>\let\textblank\@undefined
786 <latexrelease>\let\textinterrobangdown\@undefined
787 <latexrelease>\let\textinterrobang\@undefined
788 <latexrelease>
789 <latexrelease>\let\texteuro\@undefined
790 <latexrelease>
791 <latexrelease>\let\textcelsius\@undefined
792 <latexrelease>\let\textonesuperior\@undefined

```

```

793 <latexrelease>\let\textthreequartersemdash\@undefined
794 <latexrelease>\let\textthreesuperior\@undefined
795 <latexrelease>\let\texttwelveudash\@undefined
796 <latexrelease>\let\texttwosuperior\@undefined
797 <latexrelease>\let\textbardbl\@undefined
798 <latexrelease>
799 <latexrelease>\let\UseLegacyTextSymbols\@undefined
800 <latexrelease>\let\textlegacyasteriskcentered\@undefined
801 <latexrelease>\let\textlegacybardbl\@undefined
802 <latexrelease>\let\textlegacybullet\@undefined
803 <latexrelease>\let\textlegacydaggerdbl\@undefined
804 <latexrelease>\let\textlegacydagger\@undefined
805 <latexrelease>\let\textlegacyparagraph\@undefined
806 <latexrelease>\let\textlegacyperiodcentered\@undefined
807 <latexrelease>\let\textlegacysection\@undefined
808 <latexrelease>
809 <latexrelease>\EndModuleRelease

```

## 5 The textcomp package

```

810 <*TS1sty>
811 \providecommand\DeclareRelease[3]{}
812 \providecommand\DeclareCurrentRelease[2]{}
813
814 \DeclareRelease{}{2018-08-11}{textcomp-2018-08-11.sty}
815 \DeclareCurrentRelease{}{2020-02-02}
816
817 \ProvidesPackage{textcomp}
818 [2020/02/02 v2.0n Standard LaTeX package]

```

A precaution in case this is used without rebuilding the format.

```

819 \NeedsTeXFormat{LaTeX2e}[2020/02/02]

```

This is implemented by defining the default subset:

```

820 \DeclareOption{full}{\DeclareEncodingSubset{TS1}{?}{0}}
821 \DeclareOption{almostfull}{\DeclareEncodingSubset{TS1}{?}{1}}
822 \DeclareOption{euro}{\DeclareEncodingSubset{TS1}{?}{8}}
823 \DeclareOption{safe}{\DeclareEncodingSubset{TS1}{?}{9}}

```

The default is set up in the kernel is “safe” these days for unknown fonts but LaTeX has definitions for most families so it seldom applies.

If a different default is used then one needs to check the results to ensure that there aren’t “missing glyphs”.

The next set of options define the warning level (default in the kernel is info only). Using the package options you can change this behavior.

```

824 \DeclareOption{error}
825     {\gdef\tc@errorwarn{\PackageError{textcomp}}}
826 \DeclareOption{warn}
827     {\gdef\tc@errorwarn#1#2{\PackageWarning{textcomp}{#1}}}
828 \DeclareOption{info}
829     {\gdef\tc@errorwarn#1#2{\PackageInfo{textcomp}{#1}}}
830 \DeclareOption{quiet}{\gdef\tc@errorwarn#1#2{}}

```

The “force” option basically changes the sub-encoding to that of the default (which, unless changes, is 9 these days), i.e., it no longer depends on the font in use. This is

mainly there because it might have been used in older documents, but not something that is recommended.

```

831 \DeclareOption{force}{%
832   \def\CheckEncodingSubset#1#2#3#4#5{%
833     \ifnum #4>%
834       0\csname #2:?\endcsname
835       \relax
836     \expandafter\@firstoftwo
837   \else
838     \expandafter\@secondoftwo
839   \fi
840   {#1{#2}}{#3}%
841   #5}%
842 }
843 \ExecuteOptions{info}
844 \ProcessOptions\relax

```

There is not much else to do nowadays, because everything is already set up in the L<sup>A</sup>T<sub>E</sub>X kernel.

```

845 \InputIfFileExists{textcomp.cfg}
846 {\PackageInfo{textcomp}{Local configuration file used}}{}
847 </TS1sty>

```

## 5.1 The old textcomp package code

This section contains the old code for the textcomp package and its documentation. It is only used if we roll back prior to 2020. Thus all the rest is mainly for historians. Note that the old code categorized in the sub-encodings only into 6 classes not 10.

```

848 <*TS1oldsty>
849 \ProvidesPackage{textcomp}
850 [2018/08/11 v2.0j Standard LaTeX package]

```

This one is for the TS1 encoding which contains text symbols for use with the T1-encoded text fonts. It therefore first inputs the file `TS1enc.def` and then sets (or resets) the defaults for the symbols it contains. The result of this is that when one of these symbols is accessed and the current encoding does not provide it, the symbol will be supplied by a silent, local change to this encoding.

Since many PostScript fonts only implement a subset of TS1 many commands only produce black blobs of ink. To resolve the resulting problems a number of options have been introduced and some code has been developed to distinguish sub-encodings.

The sub-encodings have a numerical id and are defined as follows for TS1:

**#5** those TS1 symbols that are also in the ISO-Adobe character set; without `textcurrency`, which is often misused for the Euro. Older Type1 fonts from the non-T<sub>E</sub>X world provide only this subset.

**#4** = **#5** + `\texteuro`. Most newer fonts provide this.

**#3** = **#4** + `\textomega`. Can also be described as  $TS1 \cap (ISO-Adobe \cup MacRoman)$ . (Except for the missing "currency".)

**#2** = **#3** + `\textestimated` + `\textcurrency`. Can also be described as  $TS1 \cap Adobe-Western-2$ . This may be relevant for OpenType fonts, which usually show the Adobe-Western-2 character set.



**#1** = TS1 without `\textcircled` and `\t`. These two glyphs are often not implemented and if their kernel defaults are changed commands like `\copyright` unnecessarily fail.

**#0** = full TS1

And here a summary to go in the transcript file:

```

851 \PackageInfo{textcomp}{Sub-encoding information:\MessageBreak
852   \space\space 5 = only ISO-Adobe without
853   \string\textcurrency\MessageBreak
854   \space\space 4 = 5 + \string\texteuro\MessageBreak
855   \space\space 3 = 4 + \string\textohm\MessageBreak
856   \space\space 2 = 3 + \noexpand\textestimated+
857   \string\textcurrency\MessageBreak
858   \space\space 1 = TS1 - \noexpand\textcircled-
859   \string\t\MessageBreak
860   \space\space 0 = TS1 (full)\MessageBreak
861   Font families with sub-encoding setting implement\MessageBreak
862   only a restricted character set as indicated.\MessageBreak
863   Family '?' is the default used for unknown fonts.\MessageBreak
864   See the documentation for details\@gobble}

```

**\DeclareEncodingSubset** An encoding subset to which a font family belongs is declared by the command `\DeclareEncodingSubset` that takes the major encoding as the first argument (e.g., TS1), the family name as the second argument (e.g., `cmr`), and the subset encoding id as a third, (e.g., 0 for `cmr`).

The default encoding subset to use when nothing is known about the current font family is named `?`.

```

865 \def\DeclareEncodingSubset#1#2#3{%
866   \@ifundefined{#1:#2}%
867   {\PackageInfo{textcomp}{Setting #2 sub-encoding to #1/#3}}%
868   {\PackageInfo{textcomp}{Changing #2 sub-encoding to #1/#3}}%
869   \@namedef{#1:#2}{#3}}
870 \@onlypreamble\DeclareEncodingSubset

```

(End definition for `\DeclareEncodingSubset`.)

The options for the package are the following:

**safe** for unknown font families enables only symbols that are also in the ISO-Adobe character set; without "currency", which is often misused for the Euro. Older Type1 fonts from the non-TeX world provide only this subset.

**euro** enables the “safe” symbols plus the `\texteuro` command. Most newer fonts provide this.

**full** enables all TS1 commands; useful only with fonts like EC or CM bright.

**almostfull** same as “full”, except that `\textcircled` and `\t` are *not* redefined from their defaults to avoid that commands like `\copyright` suddenly no longer work.

**force** ignore all subset encoding definitions stored in the package itself or in the configuration file and always use the default subset as specified by one of the other options (seldom useful, only dangerous).

`\iftc@forced` Switch used to implement the force option

```
871 \newif\iftc@forced \tc@forcedfalse
```

(End definition for `\iftc@forced`.)

This is implemented by defining the default subset:

```
872 \DeclareOption{full}{\DeclareEncodingSubset{TS1}{?}{0}}
873 \DeclareOption{almostfull}{\DeclareEncodingSubset{TS1}{?}{1}}
874 \DeclareOption{euro}{\DeclareEncodingSubset{TS1}{?}{4}}
875 \DeclareOption{safe}{\DeclareEncodingSubset{TS1}{?}{5}}
```

The default is “almostfull” which means that old documents will work except that `\textcircled` and `\t` will use the kernel defaults (with the advantage that this also works if the current font (as often the case) doesn’t implement these glyphs.

The “force” option simply sets the switch to true.

```
876 \DeclareOption{force}{\tc@forcedtrue}
```

The suggestions to user is to use the “safe” option always unless that balks in which case they could switch to “almostfull” but then better check their output manually.

```
877 \def\tc@errorwarn{\PackageError}
878 \DeclareOption{warn}{\gdef\tc@errorwarn#1#2#3{\PackageWarning{#1}{#2}}}
879 \DeclareOption{quiet}{\gdef\tc@errorwarn#1#2#3{}}
880 \ExecuteOptions{almostfull}
881 \ProcessOptions\relax
```

`\CheckEncodingSubset` The command `\CheckEncodingSubset` will check if the current font family has the right encoding subset to typeset a certain command. It takes five arguments as follows: first argument is either `\UseTextSymbol`, `\UseTextAccent` depending on whether or not the symbol is a text symbol or a text accent.

The second argument is the encoding from which this symbol should be fetched.

The third argument is either a fake accessor command or an error message. the code in that argument (if ever executed) receives two arguments: `#2` and `#5` of `\CheckEncodingSubset`.

Argument four is the subset encoding id to test against: if this value is higher than the subset id of the current font family then we typeset the symbol, i.e., execute `#1{#2}#5` otherwise it runs `#3#5`, e.g., to produce an error message or fake the glyph somehow.

Argument five is the symbol or accent command that is being checked.

For usage examples see definitions below.

```
882 \iftc@forced
```

If the “force” option was given we always use the default for testing against.

```
883 \def\CheckEncodingSubset#1#2#3#4#5{%
884   \ifnum #4>%
885     0\csname #2:\endcsname
886     \relax
887   \expandafter\@firstoftwo
888   \else
889   \expandafter\@secondoftwo
890   \fi
891   {#1{#2}}{#3}%
892   #5%
893 }
```

In normal circumstances the test is a bit more complicated: first check if there exists a macro `\langle arg2\rangle:\langle current-family\rangle` and if so use that value to test against, otherwise use the default to test against.

```

894 \else
895 \def\CheckEncodingSubset#1#2#3#4#5{%
896   \ifnum #4>%
897     \expandafter\ifx\csname #2:\f@family\endcsname\relax
898       0\csname #2:?\endcsname
899     \else
900       \csname #2:\f@family\endcsname
901     \fi
902   \relax
903   \expandafter\@firstoftwo
904 \else
905   \expandafter\@secondoftwo
906 \fi
907   {#1{#2}}{#3}%
908   #5%
909 }
910 \fi

```

(End definition for `\CheckEncodingSubset`.)

`\tc@subst`

```

911 \def\tc@subst#1{%
912   \tc@errorwarn{textcomp}%
913   {Symbol \string#1 not provided by\MessageBreak
914     font family \f@family\space
915     in TS1 encoding.\MessageBreak Default family used instead}\@eha
916   \bgroup\fontfamily\textcompsubstdefault\selectfont#1\egroup
917 }

```

(End definition for `\tc@subst`.)

`\tc@error` `\tc@error` is going to be used in arg #3 of `\CheckEncodingSubset` when a symbol is not available in a certain font family. It gets pass the encoding it normally lives in (arg one) and the name of the symbol or accent that has a problem.

```

918 % error commands take argument:
919 % #1 symbol to be used
920 \def\tc@error#1{%
921   \PackageError{textcomp}% % should be latex error if general
922   {Accent \string#1 not provided by\MessageBreak
923     font family \f@family\space
924     in TS1 encoding}\@eha
925 }

```

(End definition for `\tc@error`.)

`\tc@fake@euro` `\tc@fake@euro` is an example of a “fake” definition to use in arg #3 of `\CheckEncodingSubset` when a symbol is not available in a certain font family. Here we produce an Euro symbol by combining a “C” with a “=”.

```

926 \def\tc@fake@euro#1{%
927   \leavevmode
928   \PackageInfo{textcomp}{Faking \noexpand#1for font family

```

```

929                                     \f@family\MessageBreak in TS1 encoding}%
930 \valign{##\cr
931   \vfil\hbox to 0.07em{\dimen@f@size\p@
932                                     \math@fontsfalse
933                                     \fontsize{.7\dimen@}\z@\selectfont=\hss}%
934   \vfil\cr%
935   \hbox{C}\crrcr
936 }%
937 }

```

(End definition for `\tc@fake@euro`.)

`\tc@check@symbol` These are two abbreviations that we use below to check symbols and accents in TS1.  
`\tc@check@accent` Only there to save some space, e.g., we can then write

```

DeclareTextCommandDefault{\textcurrency}{\tc@check@symbol3\textcurrency}

```

to ensure that `\textcurrency` is only typeset if the current font has a TS1 subset id of less than 3. Otherwise `\tc@error` is called telling the user that for this font family `\textcurrency` is not available.

```

938 \def\tc@check@symbol{\CheckEncodingSubset\UseTextSymbol{TS1}\tc@subst}
939 \def\tc@check@accent{\CheckEncodingSubset\UseTextAccent{TS1}\tc@error}

```

(End definition for `\tc@check@symbol` and `\tc@check@accent`.)

We start with the commands that are “safe” and which can be unconditionally set up, first the accents...

```

940 \DeclareTextAccentDefault{\capitalcedilla}{TS1}
941 \DeclareTextAccentDefault{\capitalogonek}{TS1}
942 \DeclareTextAccentDefault{\capitalgrave}{TS1}
943 \DeclareTextAccentDefault{\capitalacute}{TS1}
944 \DeclareTextAccentDefault{\capitalcircumflex}{TS1}
945 \DeclareTextAccentDefault{\capitaltilde}{TS1}
946 \DeclareTextAccentDefault{\capitaldieresis}{TS1}
947 \DeclareTextAccentDefault{\capitalhungarumlaut}{TS1}
948 \DeclareTextAccentDefault{\capitalring}{TS1}
949 \DeclareTextAccentDefault{\capitalcaron}{TS1}
950 \DeclareTextAccentDefault{\capitalbreve}{TS1}
951 \DeclareTextAccentDefault{\capitalmacron}{TS1}
952 \DeclareTextAccentDefault{\capitaldotaccent}{TS1}

```

...and then the other glyphs.

```

953 \DeclareTextSymbolDefault{\textcapitalcompwordmark}{TS1}
954 \DeclareTextSymbolDefault{\textascendercompwordmark}{TS1}
955 \DeclareTextSymbolDefault{\textquotestraightbase}{TS1}
956 \DeclareTextSymbolDefault{\textquotestraightdblbase}{TS1}
957 \DeclareTextSymbolDefault{\texttwelveudash}{TS1}
958 \DeclareTextSymbolDefault{\textthreequartersemdash}{TS1}
959 \DeclareTextSymbolDefault{\textdollar}{TS1}
960 \DeclareTextSymbolDefault{\textquotesingle}{TS1}
961 \DeclareTextSymbolDefault{\textasteriskcentered}{TS1}
962 \DeclareTextSymbolDefault{\textfractionsolidus}{TS1}
963 \DeclareTextSymbolDefault{\textminus}{TS1}
964 \DeclareTextSymbolDefault{\textlbrackdbl}{TS1}
965 \DeclareTextSymbolDefault{\textrbrackdbl}{TS1}
966 \DeclareTextSymbolDefault{\textasciigrave}{TS1}

```

```

967 \DeclareTextSymbolDefault{\texttildelow}{TS1}
968 \DeclareTextSymbolDefault{\textasciibreve}{TS1}
969 \DeclareTextSymbolDefault{\textasciicaron}{TS1}
970 \DeclareTextSymbolDefault{\textgravedbl}{TS1}
971 \DeclareTextSymbolDefault{\textacutedbl}{TS1}
972 \DeclareTextSymbolDefault{\textdagger}{TS1}
973 \DeclareTextSymbolDefault{\textdaggerdbl}{TS1}
974 \DeclareTextSymbolDefault{\textbardbl}{TS1}
975 \DeclareTextSymbolDefault{\textperthousand}{TS1}
976 \DeclareTextSymbolDefault{\textbullet}{TS1}
977 \DeclareTextSymbolDefault{\textcelsius}{TS1}
978 \DeclareTextSymbolDefault{\textflorin}{TS1}
979 \DeclareTextSymbolDefault{\texttrademark}{TS1}
980 \DeclareTextSymbolDefault{\textcent}{TS1}
981 \DeclareTextSymbolDefault{\textsterling}{TS1}
982 \DeclareTextSymbolDefault{\textyen}{TS1}
983 \DeclareTextSymbolDefault{\textbrokenbar}{TS1}
984 \DeclareTextSymbolDefault{\textsection}{TS1}
985 \DeclareTextSymbolDefault{\textasciidieresis}{TS1}
986 \DeclareTextSymbolDefault{\textcopyright}{TS1}
987 \DeclareTextSymbolDefault{\textordfeminine}{TS1}
988 \DeclareTextSymbolDefault{\textlnot}{TS1}
989 \DeclareTextSymbolDefault{\textregistered}{TS1}
990 \DeclareTextSymbolDefault{\textasciimacron}{TS1}
991 \DeclareTextSymbolDefault{\textdegree}{TS1}
992 \DeclareTextSymbolDefault{\textpm}{TS1}
993 \DeclareTextSymbolDefault{\texttwosuperior}{TS1}
994 \DeclareTextSymbolDefault{\textthreesuperior}{TS1}
995 \DeclareTextSymbolDefault{\textasciiacute}{TS1}
996 \DeclareTextSymbolDefault{\textmu}{TS1}
997 \DeclareTextSymbolDefault{\textparagraph}{TS1}
998 \DeclareTextSymbolDefault{\textperiodcentered}{TS1}
999 \DeclareTextSymbolDefault{\textonesuperior}{TS1}
1000 \DeclareTextSymbolDefault{\textordmasculine}{TS1}
1001 \DeclareTextSymbolDefault{\textonequarter}{TS1}
1002 \DeclareTextSymbolDefault{\textonehalf}{TS1}
1003 \DeclareTextSymbolDefault{\textthreequarters}{TS1}
1004 \DeclareTextSymbolDefault{\texttimes}{TS1}
1005 \DeclareTextSymbolDefault{\textdiv}{TS1}

```

The `\texteuro` is only available for subsets with id 4 or less. Otherwise we fake the glyph using `\tc@fake@euro`

```

1006 \DeclareTextCommandDefault{\texteuro}
1007   {\CheckEncodingSubset\UseTextSymbol{TS1}\tc@fake@euro5\texteuro}

```

The `\textohm` is only available for subsets with id 3 or less. Otherwise we produce an error.

```

1008 \DeclareTextCommandDefault{\textohm}{\tc@check@symbol4\textohm}

```

The `\textestimated` and `\textcurrency` are only provided for fonts with subset encoding with id 2 or less.

```

1009 \DeclareTextCommandDefault{\textestimated}%
1010   {\tc@check@symbol3\textestimated}
1011 \DeclareTextCommandDefault{\textcurrency}%
1012   {\tc@check@symbol3\textcurrency}

```

Nearly all of the remaining glyphs are provided only with fonts with id 1 or 0, i.e., are essentially complete.

```

1013 \DeclareTextCommandDefault{\capitaltie}%
1014   {\tc@check@accent2\capitaltie}
1015 \DeclareTextCommandDefault{\newtie}%
1016   {\tc@check@accent2\newtie}
1017 \DeclareTextCommandDefault{\capitalnewtie}%
1018   {\tc@check@accent2\capitalnewtie}
1019 \DeclareTextCommandDefault{\textleftarrow}%
1020   {\tc@check@symbol2\textleftarrow}
1021 \DeclareTextCommandDefault{\textrightarrow}%
1022   {\tc@check@symbol2\textrightarrow}
1023 \DeclareTextCommandDefault{\textblank}%
1024   {\tc@check@symbol2\textblank}
1025 \DeclareTextCommandDefault{\textdblhyphen}%
1026   {\tc@check@symbol2\textdblhyphen}
1027 \DeclareTextCommandDefault{\textzerooldstyle}%
1028   {\tc@check@symbol2\textzerooldstyle}
1029 \DeclareTextCommandDefault{\textoneoldstyle}%
1030   {\tc@check@symbol2\textoneoldstyle}
1031 \DeclareTextCommandDefault{\texttwooldstyle}%
1032   {\tc@check@symbol2\texttwooldstyle}
1033 \DeclareTextCommandDefault{\textthreeoldstyle}%
1034   {\tc@check@symbol2\textthreeoldstyle}
1035 \DeclareTextCommandDefault{\textfouroldstyle}%
1036   {\tc@check@symbol2\textfouroldstyle}
1037 \DeclareTextCommandDefault{\textfiveoldstyle}%
1038   {\tc@check@symbol2\textfiveoldstyle}
1039 \DeclareTextCommandDefault{\textsixoldstyle}%
1040   {\tc@check@symbol2\textsixoldstyle}
1041 \DeclareTextCommandDefault{\textsevenoldstyle}%
1042   {\tc@check@symbol2\textsevenoldstyle}
1043 \DeclareTextCommandDefault{\texteightoldstyle}%
1044   {\tc@check@symbol2\texteightoldstyle}
1045 \DeclareTextCommandDefault{\textnineoldstyle}%
1046   {\tc@check@symbol2\textnineoldstyle}
1047 \DeclareTextCommandDefault{\textlangle}%
1048   {\tc@check@symbol2\textlangle}
1049 \DeclareTextCommandDefault{\textrangle}%
1050   {\tc@check@symbol2\textrangle}
1051 \DeclareTextCommandDefault{\textmho}%
1052   {\tc@check@symbol2\textmho}
1053 \DeclareTextCommandDefault{\textbigcircle}%
1054   {\tc@check@symbol2\textbigcircle}
1055 \DeclareTextCommandDefault{\textuparrow}%
1056   {\tc@check@symbol2\textuparrow}
1057 \DeclareTextCommandDefault{\textdownarrow}%
1058   {\tc@check@symbol2\textdownarrow}
1059 \DeclareTextCommandDefault{\textborn}%
1060   {\tc@check@symbol2\textborn}
1061 \DeclareTextCommandDefault{\textdivorced}%
1062   {\tc@check@symbol2\textdivorced}
1063 \DeclareTextCommandDefault{\textdied}%
1064   {\tc@check@symbol2\textdied}

```

```

1065 \DeclareTextCommandDefault{\textleaf}%
1066     {\tc@check@symbol2\textleaf}
1067 \DeclareTextCommandDefault{\textmarried}%
1068     {\tc@check@symbol2\textmarried}
1069 \DeclareTextCommandDefault{\textmusicalnote}%
1070     {\tc@check@symbol2\textmusicalnote}
1071 \DeclareTextCommandDefault{\textdblhyphenchar}%
1072     {\tc@check@symbol2\textdblhyphenchar}
1073 \DeclareTextCommandDefault{\textdollaroldstyle}%
1074     {\tc@check@symbol2\textdollaroldstyle}
1075 \DeclareTextCommandDefault{\textcentoldstyle}%
1076     {\tc@check@symbol2\textcentoldstyle}
1077 \DeclareTextCommandDefault{\textcolonmonetary}%
1078     {\tc@check@symbol2\textcolonmonetary}
1079 \DeclareTextCommandDefault{\textwon}%
1080     {\tc@check@symbol2\textwon}
1081 \DeclareTextCommandDefault{\textnaira}%
1082     {\tc@check@symbol2\textnaira}
1083 \DeclareTextCommandDefault{\textguarani}%
1084     {\tc@check@symbol2\textguarani}
1085 \DeclareTextCommandDefault{\textpeso}%
1086     {\tc@check@symbol2\textpeso}
1087 \DeclareTextCommandDefault{\textlira}%
1088     {\tc@check@symbol2\textlira}
1089 \DeclareTextCommandDefault{\textrecipe}%
1090     {\tc@check@symbol2\textrecipe}
1091 \DeclareTextCommandDefault{\textinterrobang}%
1092     {\tc@check@symbol2\textinterrobang}
1093 \DeclareTextCommandDefault{\textinterrobangdown}%
1094     {\tc@check@symbol2\textinterrobangdown}
1095 \DeclareTextCommandDefault{\textdong}%
1096     {\tc@check@symbol2\textdong}
1097 \DeclareTextCommandDefault{\textpertenthousand}%
1098     {\tc@check@symbol2\textpertenthousand}
1099 \DeclareTextCommandDefault{\textpilcrow}%
1100     {\tc@check@symbol2\textpilcrow}
1101 \DeclareTextCommandDefault{\textbaht}%
1102     {\tc@check@symbol2\textbaht}
1103 \DeclareTextCommandDefault{\textnumero}%
1104     {\tc@check@symbol2\textnumero}
1105 \DeclareTextCommandDefault{\textdiscount}%
1106     {\tc@check@symbol2\textdiscount}
1107 \DeclareTextCommandDefault{\textopenbullet}%
1108     {\tc@check@symbol2\textopenbullet}
1109 \DeclareTextCommandDefault{\textservicemark}%
1110     {\tc@check@symbol2\textservicemark}
1111 \DeclareTextCommandDefault{\textlquill}%
1112     {\tc@check@symbol2\textlquill}
1113 \DeclareTextCommandDefault{\textrquill}%
1114     {\tc@check@symbol2\textrquill}
1115 \DeclareTextCommandDefault{\textcopyleft}%
1116     {\tc@check@symbol2\textcopyleft}
1117 \DeclareTextCommandDefault{\textcircledP}%
1118     {\tc@check@symbol2\textcircledP}

```

```

1119 \DeclareTextCommandDefault{\textreferencemark}%
1120   {\tc@check@symbol2\textreferencemark}
1121 \DeclareTextCommandDefault{\textsurd}%
1122   {\tc@check@symbol2\textsurd}

```

The `\textcircled` and `\t` are handled specially, unless the current font has a subset id of 0 (i.e. full TS1) we pick the symbols up from the math font encodings, i.e., the third argument to `\CheckEncodingSubset` uses `\UseTextAccent` to get them from there.

```

1123 \DeclareTextCommandDefault{\textcircled}
1124   {\CheckEncodingSubset\UseTextAccent{TS1}%
1125    {\UseTextAccent{OMS}}1\textcircled}
1126 \DeclareTextCommandDefault{\t}
1127   {\CheckEncodingSubset\UseTextAccent{TS1}%
1128    {\UseTextAccent{OML}}1\t}

```

Finally input the encoding-specific definitions for TS1 thus making the top-level definitions optimized for this encoding (and not for the default encoding).

```

1129 \input{ts1enc.def}

```

Now having the new glyphs available we also want to make sure that they are used. For most cases this will automatically happen but for some glyphs there are inferior definitions already known to L<sup>A</sup>T<sub>E</sub>X which will prevent the usage of the TS1 versions. So we better get rid of them:

```

1130 \UndeclareTextCommand{\textsterling}{OT1}
1131 \UndeclareTextCommand{\textdollar} {OT1}

```

Similar declarations should probably be made for other encodings like OT4 if they are in use.

```

1132 %\UndeclareTextCommand{\textsterling}{OT4}
1133 %\UndeclareTextCommand{\textdollar} {OT4}

```

From the T1 encoding there are two candidates for removal: `%0` and `%00` since these are both constructed from `%` followed by a tiny ‘`o`’ rather than being a single glyph. The problem with this approach is that in PostScript fonts this small zero is usually not available resulting in `%■` rather than `%0` while the real glyph (at least for `\textperthousand`) is available in the PostScript version of TS1. So for the moment we compromise by removing the T1 declaration for `\textperthousand` but keeping the one for `\textpertenthousand`. This will have the effect that with Computer Modern fonts everything will come out (although `%0` and `%00` are not taken from the same physical font) and with PostScript fonts `%0` will come out correctly while `%00` will most likely look like `%■` — which is probably an improvement over just getting a single ‘`■`’ to indicate a completely missing glyph, which would happen if we also ‘undeclared’ `\textpertenthousand`.

```

1134 \UndeclareTextCommand{\textperthousand}{T1}
1135 %\UndeclareTextCommand{\textpertenthousand}{T1}

```

### 5.1.1 Supporting oldstyle digits

```

1136 \DeclareRobustCommand\oldstylenums[1]{%
1137   \begingroup
1138   \ifmmode
1139     \mathgroup\symletters #1%
1140   \else
1141     \CheckEncodingSubset\@use@text@encoding{TS1}%
1142     {\PackageWarning{textcomp}%

```



```

1143         {Oldstyle digits unavailable for
1144         family \f@family.\MessageBreak
1145         Lining digits used instead}}}%
1146     \tw@{#1}%
1147 \fi
1148 \endgroup
1149 }

```

### 5.1.2 Subset encoding defaults

For many font families commonly used in the T<sub>E</sub>X world we provide the subset encoding data here. Users can add additional font families in the file `textcomp.cfg` if they own other fonts.

However, if the option “forced” was given then all subset encoding specifications are ignored, so there is no point in setting any of them up:

```

1150 \iftc@forced \else

```

Computer modern based fonts (e.g., CM, CM-Bright, Concrete):

```

1151 \DeclareEncodingSubset{TS1}{cmr}      {0}
1152 \DeclareEncodingSubset{TS1}{cmss}     {0}
1153 \DeclareEncodingSubset{TS1}{cmtt}     {0}
1154 \DeclareEncodingSubset{TS1}{cmvtt}    {0}
1155 \DeclareEncodingSubset{TS1}{cmbr}     {0}
1156 \DeclareEncodingSubset{TS1}{cmtl}     {0}
1157 \DeclareEncodingSubset{TS1}{ccr}      {0}

```

PSNFSS fonts:

```

1158 \DeclareEncodingSubset{TS1}{ptm}      {4}
1159 \DeclareEncodingSubset{TS1}{pcr}      {4}
1160 \DeclareEncodingSubset{TS1}{phv}      {4}
1161 \DeclareEncodingSubset{TS1}{ppl}      {3}
1162 \DeclareEncodingSubset{TS1}{pag}      {4}
1163 \DeclareEncodingSubset{TS1}{pbk}      {4}
1164 \DeclareEncodingSubset{TS1}{pnc}      {4}
1165 \DeclareEncodingSubset{TS1}{pzc}      {4}
1166 \DeclareEncodingSubset{TS1}{bch}      {4}
1167 \DeclareEncodingSubset{TS1}{put}      {5}

```

Other CTAN fonts (probably not complete):

```

1168 \DeclareEncodingSubset{TS1}{uag}      {5}
1169 \DeclareEncodingSubset{TS1}{ugq}      {5}
1170 \DeclareEncodingSubset{TS1}{ul8}      {4}
1171 \DeclareEncodingSubset{TS1}{ul9}      {4}    % (LuxiSans, one day)
1172 \DeclareEncodingSubset{TS1}{augie}    {5}
1173 \DeclareEncodingSubset{TS1}{dayrom}    {3}
1174 \DeclareEncodingSubset{TS1}{dayroms}  {3}
1175 \DeclareEncodingSubset{TS1}{pxr}      {0}
1176 \DeclareEncodingSubset{TS1}{pxss}     {0}
1177 \DeclareEncodingSubset{TS1}{pxtt}     {0}
1178 \DeclareEncodingSubset{TS1}{txr}      {0}
1179 \DeclareEncodingSubset{TS1}{txss}     {0}
1180 \DeclareEncodingSubset{TS1}{txtt}     {0}

```

Latin Modern and TeX Gyre:

```

1181 \DeclareEncodingSubset{TS1}{lmr}      {0}
1182 \DeclareEncodingSubset{TS1}{lmdh}     {0}

```

```

1183 \DeclareEncodingSubset{TS1}{lmss}    {0}
1184 \DeclareEncodingSubset{TS1}{lmssq}   {0}
1185 \DeclareEncodingSubset{TS1}{lmvtt}   {0}
1186 \DeclareEncodingSubset{TS1}{lmtt}    {0}

1187 \DeclareEncodingSubset{TS1}{qhv}     {0}
1188 \DeclareEncodingSubset{TS1}{qag}     {0}
1189 \DeclareEncodingSubset{TS1}{qbk}     {0}
1190 \DeclareEncodingSubset{TS1}{qcr}     {0}
1191 \DeclareEncodingSubset{TS1}{qcs}     {0}
1192 \DeclareEncodingSubset{TS1}{qpl}     {0}
1193 \DeclareEncodingSubset{TS1}{qtm}     {0}
1194 \DeclareEncodingSubset{TS1}{qzc}     {0}
1195 \DeclareEncodingSubset{TS1}{qhvc}    {0}

```

Fourier-GUTenberg:

```

1196 \DeclareEncodingSubset{TS1}{futs}    {4}
1197 \DeclareEncodingSubset{TS1}{futex}   {4}
1198 \DeclareEncodingSubset{TS1}{futj}    {4}

```

Y&Y's Lucida Bright

```

1199 \DeclareEncodingSubset{TS1}{hlh}     {3}
1200 \DeclareEncodingSubset{TS1}{hls}     {3}
1201 \DeclareEncodingSubset{TS1}{hlst}    {3}

```

The remaining settings for Lucida are conservative: the following fonts contain the `\textohm` character but not the `\texteuro`, i.e., belong to neither subset 4 nor subset 3. If you want to use the `\textohm` with these fonts copy these definition to `textcomp.cfg` and change the subset to 3. However in that case make sure that you do not use the `\texteuro`.

```

1202 \DeclareEncodingSubset{TS1}{hlct}    {5}
1203 \DeclareEncodingSubset{TS1}{hlx}     {5}
1204 \DeclareEncodingSubset{TS1}{hlce}    {5}
1205 \DeclareEncodingSubset{TS1}{hlcn}    {5}
1206 \DeclareEncodingSubset{TS1}{hlcw}    {5}
1207 \DeclareEncodingSubset{TS1}{hlcf}    {5}

```

Other commercial families...

```

1208 \DeclareEncodingSubset{TS1}{pplx}    {3}
1209 \DeclareEncodingSubset{TS1}{pplj}    {3}
1210 \DeclareEncodingSubset{TS1}{ptmx}    {4}
1211 \DeclareEncodingSubset{TS1}{ptmj}    {4}

```

If the file `textcomp.cfg` exists it will be loaded at this point. This allows to define further subset encodings for font families not covered by default.

```

1212 \InputIfFileExists{textcomp.cfg}
1213   {\PackageInfo{textcomp}{Local configuration file used}}{}
1214 \fi
1215 </TS1oldsty>

```

## File F

# ltpageno.dtx

## 1 Page Numbering

Page numbers are produced by a page counter, used just like any other counter. The only difference is that `\c@page` contains the number of the next page to be output (the one currently being produced), rather than one minus it. Thus, it is normally initialized to 1 rather than 0. `\c@page` is defined to be `\count0`, rather than a count assigned by `\newcount`.

`\pagenumbering` The user sets the page number style with the `\pagenumbering{<foo>}` command, which sets the page counter to 1 and defines `\thepage` to be `\foo`. For example, `\pagenumbering{roman}` causes pages to be numbered i, ii, etc.

```
1 <*2ekernel>
2 \message{page nos.,}

3 \countdef\c@page=0 \c@page=1
4 \def\c1@page{}
5 \def\pagenumbering#1{%
6   \global\c@page \c@one \gdef\thepage{\csname @#1\endcsname
7     \c@page}}
8 </2ekernel>
```

# File G

## ltxref.dtx

### 1 Cross Referencing

The user writes `\label{foo}` to define the following cross-references:

`\ref*{foo}`: value of most recently incremented referenceable counter. in the current environment. (Chapter, section, theorem, footnote and enumeration counters and other counters stepped with `\refstepcounter` are referenceable.)

`\pageref*{foo}`: page number at which `\label{foo}` command appeared. where foo can be any string of characters not containing `\`, `{` or `}`.

Note: The scope of the `\label` command is delimited by environments, so `\begin{theorem} \label{foo} ... \end{theorem} \label{bar}` defines `\ref{foo}` to be the theorem number and `\ref{bar}` to be the current section number.

Note: `\label` does the right thing in terms of spacing – i.e., leaving a space on both sides of it is equivalent to leaving a space on either side.

Note: the starred versions `\ref*` and `\pageref*` are provided to align with the use of `hyperref`. Without `hyperref` (or some other package using the starred form) the star is simply ignored.

#### 1.1 Cross Referencing

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

```
1 <*2ekernel>
2 \message{x-ref,}
```

This is implemented as follows. A referenceable counter CNT is incremented by the command `\refstepcounter{CNT}`, which sets `\@currentlabel == {CNT}{eval(\p@cnt\theCNT)}`. The command `\label{FOO}` then writes the following on file `\@auxout`:

```
\newlabel{FOO}{\eval(\@currentlabel)}{\eval(\thepage)}}
```

```
\ref{FOO} ==
BEGIN
  if \r@foo undefined
  then @refundefined := G T
    ??
    Warning: 'reference foo on page ... undefined'
  else \@car \eval(\r@FOO)\@nil
  fi
END
```

```
\pageref{foo} =
BEGIN
  if \r@foo undefined
  then @refundefined := G T
    ??
```

```

Warning: 'reference foo on page ... undefined'
else \@cdr \eval{\r@F00}\@nil
fi
END

```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

**\labelformat** A reference via **\ref** produces by default the data associated with the corresponding **\label** command (typically a number); any additional formatting has to be provided by the user. If, for example, references to equations are always to be typeset as “equation (*number*)”, one has to code “**equation** (**\ref{key}**)”. With **\labelformat** there is a possibility to generate such frills automatically without resorting to low-level coding. The command takes two arguments: the first is the name of a counter and the second is its representation when referenced. This means that for a successful usage, one has to know the counter name being used for generating the label, though in practice this should not pose a problem. The current counter number is picked up as an argument. Here are two examples:

```

\labelformat{section}{section-#1}
\labelformat{equation}{equation-(#1)}

```

**\Ref** A side effect of using **\labelformat** is that, depending on the defined formatting, it becomes impossible to use **\ref** at the beginning of a sentence (if its replacement text starts with a lowercase letter). To overcome this problem we introduce the command **\Ref** that behave like **\ref** except that it uppercases the first token of the generated string.

To make **\Ref** work properly the very first token in the second argument of **\labelformat** has to be a simple ASCII or UTF-8 letter, otherwise the capitalization will fail or worse, you will end up with some error messages. If you actually need something more complicated in this place (e.g., an accented letter not written as a UTF-8 character) you have to explicitly surround it with braces, to identify the part that needs to be capitalized. For example, for figure references in the Hungarian language you might want to write **\labelformat{figure}{\’a}bra~\thefigure}** or use **\labelformat{figure}{ábra~\thefigure}** which avoids the brace problem.

**\G@refundefinedtrue** This does not save on name-space (since **\G@refundefinedfalse** was never needed) but **\@refundefined** it does make the implementation of such one-way switches more consistent. The extra macro to make the change is used since this change appears several times.

**Note** despite its name, **\G@refundefinedtrue** does *not* correspond to an **\if** command, and there is no matching **...false**. It would be more natural to call the command **\G@refundefined** (as inspection of the change log will reveal) but unfortunately such a change would break any package that had defined a **\ref**-like command that mimicked the definition of **\ref**, calling **\G@refundefinedtrue**. Inspection of the T<sub>E</sub>X archives revealed several such packages, and so this command has been named **...true** so that the definition of **\ref** need not be changed, and the packages will work without change.

```

3 % \newif\ifG@refundefined
4 % \def\G@refundefinedtrue{\global\let\ifG@refundefined\iftrue}
5 % \def\G@refundefinedfalse{\global\let\ifG@refundefined\iffalse}
6 \def\G@refundefinedtrue{%
7   \gdef\@refundefined{%
8     \@latex@warning@no@line{There were undefined references}}
9 \let\@refundefined\relax

```

(End definition for \G@refundefinedtrue and \@refundefined.)

\ref Referencing a \label. RmS 91/10/25: added a few extra \reset@font, as suggested by  
\pageref Bernd Raichle  
\setref RmS 92/08/14: made \ref and \pageref robust  
RmS 93/09/08: Added setting of refundefined switch.

```

10 \def\@setref#1#2#3{%
11   \ifx#1\relax
12     \protect\G@refundefinedtrue
13     \nfss@text{\reset@font\bfseries ??}%
14     \@latex@warning{Reference '#3' on page \thepage \space
15                   undefined}%
16   \else
17     \expandafter#2#1\null
18   \fi}

19 \</2kernel>
20 \<*2kernel | latexrelease>
21 \<latexrelease>\IncludeInRelease{2022/06/01}%
22 \<latexrelease>          {\ref}{Add starred reference commands}%

23 \def\@kernel@sref#1{\expandafter\@setref\csname r@#1\endcsname\@firstoftwo{#1}}
24 \def\@kernel@spageref#1{\expandafter\@setref\csname r@#1\endcsname
25                        \@secondoftwo{#1}}
26 \let\@kernel@ref\@kernel@sref
27 \let\@kernel@pageref\@kernel@spageref
28 \NewDocumentCommand\ref{s}
29   {\IfBooleanTF{#1}{\@kernel@sref}{\@kernel@ref}}
30 \NewDocumentCommand\pageref{s}
31   {\IfBooleanTF{#1}{\@kernel@spageref}{\@kernel@pageref}}

```

As the commands are now protected we also need expandable versions for use in \ifthenelse:

```

32 \def\@kernel@pageref@exp#1{\csname cs_if_exist:cTF\endcsname
33   {r@#1}{\csname tl_item:cn\endcsname{r@#1}{2}}{0}}
34 \def\@kernel@ref@exp#1{\csname cs_if_exist:cTF\endcsname
35   {r@#1}{\csname tl_item:cn\endcsname{r@#1}{1}}{0}}

36 \</2kernel | latexrelease>
37 \<latexrelease>\EndIncludeInRelease
38 \<latexrelease>\IncludeInRelease{0000/00/00}%
39 \<latexrelease>          {\ref}{Add starred reference commands}%
40 \<latexrelease>\def\ref#1{\expandafter\@setref\csname r@#1\endcsname\@firstoftwo{#1}}
41 \<latexrelease>\def\pageref#1{\expandafter\@setref\csname r@#1\endcsname
42                                     \@secondoftwo{#1}}
43 \<latexrelease>
44 \<latexrelease>\EndIncludeInRelease
45 \<*2kernel>

```

(End definition for \ref, \pageref, and \@setref.)

\newlabel This command will be written to the .aux file to pass label information from one run to another.

The internal form of `\newlabel` and `\bibcite`. Note that this macro does its work inside a group. That way the local assignments it needs to do don't clutter the save stack. This prevents large documents with many labels to run out of save stack.

```

46 \def\@newl@bel#1#2#3{%
47   \ifundefined{#1#2}%
48     \relax
49     {\gdef \@multiplelabels {%
50       \@latex@warning@no@line{There were multiply-defined labels}}}%
51       \@latex@warning@no@line{Label '#2' multiply defined}}%
52   \global\@namedef{#1#2}{#3}}
53 \def\newlabel{\@newl@bel r}
54 \@onlypreamble\@newl@bel

```

(End definition for `\newlabel` and `\@newl@bel`.)

`\if@multiplelabels` This is redefined to produce a warning if at least one label is defined more than once. It is executed by the `\enddocument` command.

```

55 \let \@multiplelabels \relax

```

(End definition for `\if@multiplelabels` and `\@multiplelabels`.)

`\label` The commands `\label` and `\refstepcounter` have been changed to allow `\protect`'ed commands to work properly. For example,

```

\def\thechapter{\protect\foo{\arabic{chapter}.\roman{section}}}

```

will cause a `\label{bar}` command to define `\ref{bar}` to expand to something like `\foo{4.d}`. Change made 20 Jul 88.

```

56 \def\label#1{\@bsphack
57   \protected@write\@auxout{%
58     {\string\newlabel{#1}{\@currentlabel}{\thepage}}}%
59   \@esphack}

```

(End definition for `\label`.)

```

60 </2ekernel>
61 <*2ekernel|latexrelease>
62 <latexrelease>\IncludeInRelease{2022/06/01}%
63 <latexrelease>          {\Ref}{Add starred version}%

```

`\refstepcounter` Step the counter and allow for labels to point to its current value.

```

64 \def\@currentcounter{}
65 \def\refstepcounter#1{\stepcounter{#1}%
66   \edef\@currentcounter{#1}%
67   \protected@edef\@currentlabel

```

By generating the second csname first the `\p@...` command can grab it as an argument which can be helpful for more complicated typesetting arrangements.

The trick is to ensure that `\csname the#1\endcsname` is turned into a single token before `\p@...` is expanded further. This way, if the `\p@...` command is a macro with one argument it will receive `\the...`. With the original kernel code (i.e., without the `\expandafter`) it will instead pick up `\csname` which would be disastrous.

Using `\expandafter` instead of braces delimiting the argument is better because, assuming that the `\p@...` command is not defined as a macro with one argument, the

braces will stay and prohibit kerning that might otherwise happen between the glyphs generated by `\the...` and surrounding glyphs.

```
68      {\csname p@#1\expandafter\endcsname\csname the#1\endcsname}%
69  }
```

(End definition for `\refstepcounter`.)

**\labelformat** A shortcut to set the `\p@...` macro for a counter. It will pick up the counter representation as an argument so that it can be specially formatted.

```
70 \def\labelformat#1{\expandafter\def\csname p@#1\endcsname##1}
```

(End definition for `\labelformat`.)

**\Ref** This macro expands the result of `\ref` and then uppercases the first token. Only useful if the label was generated via `\labelformat` and contains some lower case letter at its start. If the label starts with a complicated construct (e.g., an accented letter that is provided via a command, e.g., `\"a` instead of a UTF-8 character like `ä`) one has to surround everything that needs uppercasing in a brace group in the definition of `\labelformat`.<sup>31</sup>

```
71 \def\@kernel@Ref#1{\protected@edef\@tempa{\@kernel@ref{#1}}%
72   \expandafter\MakeUppercase\@tempa}
73 \def\@kernel@sRef#1{\protected@edef\@tempa{\@kernel@sref{#1}}%
74   \expandafter\MakeUppercase\@tempa}
75 \NewDocumentCommand\Ref{s}
76   {\IfBooleanTF{#1}{\@kernel@sRef}{\@kernel@Ref}}
```

(End definition for `\Ref`.)

```
77 </2ekernel | latexrelease>
78 <latexrelease>\EndIncludeInRelease
79 <latexrelease>\IncludeInRelease{2020/10/01}%
80 <latexrelease>      {\Ref}{Add starred version}%
81 <latexrelease>\def\@currentcounter{}
82 <latexrelease>\def\refstepcounter#1{\stepcounter{#1}%
83   <latexrelease>      \edef\@currentcounter{#1}%
84   <latexrelease>      \protected@edef\@currentlabel
85   <latexrelease>      {\csname p@#1\expandafter\endcsname\csname the#1\endcsname}%
86   <latexrelease>}}
87 <latexrelease>\def\labelformat#1{\expandafter\def\csname p@#1\endcsname##1}
88 <latexrelease>\DeclareRobustCommand\Ref[1]{\protected@edef\@tempa{\ref{#1}}%
89   <latexrelease>      \expandafter\MakeUppercase\@tempa}
90 <latexrelease>\EndIncludeInRelease
91 <latexrelease>\IncludeInRelease{2019/10/01}%
92 <latexrelease>      {\refstepcounter}{Add \labelformat and \Ref}%
93 <latexrelease>\let\@currentcounter\@undefined
94 <latexrelease>\def\refstepcounter#1{\stepcounter{#1}%
95   <latexrelease>      \protected@edef\@currentlabel
96   <latexrelease>      {\csname p@#1\expandafter\endcsname\csname the#1\endcsname}%
97   <latexrelease>}}
98 <latexrelease>\def\labelformat#1{\expandafter\def\csname p@#1\endcsname##1}
99 <latexrelease>\DeclareRobustCommand\Ref[1]{\protected@edef\@tempa{\ref{#1}}%
100 <latexrelease>      \expandafter\MakeUppercase\@tempa}
```

<sup>31</sup>There is one problem with this approach: the braces are kept in a normal `\ref` which might spoil kerning. Perhaps one day this needs redoing.



```

101 <latexrelease>\EndIncludeInRelease
102 <latexrelease>\IncludeInRelease{0000/00/00}%
103 <latexrelease>          {\refstepcounter}{Add \labelformat and \Ref}%
104 <latexrelease>
105 <latexrelease>\def\refstepcounter#1{\stepcounter{#1}%
106 <latexrelease>      \protected@edef\@currentlabel
107 <latexrelease>          {\csname p@#1\endcsname\csname the#1\endcsname}%
108 <latexrelease>}
109 <latexrelease>\let\labelformat\@undefined
110 <latexrelease>\let\Ref\@undefined
111 <latexrelease>
112 <latexrelease>\EndIncludeInRelease
113 <*2ekernel>

```

\@currentlabel Default for \label commands that come before any environment.

```

114 \def\@currentlabel{}
(End definition for \@currentlabel.)
115 </2ekernel>

```

## File H

# ltmiscen.dtx

## 1 Miscellaneous Environments

This section implements the basic environment mechanism, and also a few specific environments including `document`, The math environments and related commands, the ‘flushing’ environments, (`center`, `flushleft`, `flushright`), and `verbatim`.

```
1 <*2ekernel>
2 \message{environments,}
```

### 1.1 Environments

`\begin{foo}` and `\end{foo}` are used to delimit environment `foo`.

`\begin{foo}` starts a group and calls `\foo` if it is defined, otherwise it does nothing.

`\end{foo}` checks to see that it matches the corresponding `\begin` and if so, it calls `\endfoo` and does an `\endgroup`. Otherwise, `\end{foo}` does nothing.

If `\end{foo}` needs to ignore blanks after it, then `\endfoo` should globally set the `@ignore` switch true with `\@ignoretrue` (this will automatically be global).

NOTE: `\@@end` is defined to be the `\end` command of  $\mathrm{T}_{\mathrm{E}}\mathrm{X}82$ .

`\enddocument` is the user’s command for ending the manuscript file.

`\stop` is a panic button — to end  $\mathrm{T}_{\mathrm{E}}\mathrm{X}$  in the middle.

*Historical  $\mathrm{L}^{\mathrm{A}}\mathrm{T}_{\mathrm{E}}\mathrm{X} 2.09$  comments (not necessarily accurate any more):*

```
\enddocument ==
BEGIN
  \@checkend{document}    %% checks for unmatched \begin
  \clearpage
  \begingroup
    if @filesw = true
    then close file @mainaux
    if G@refundefined = true
    then LaTeX Warning: 'There are undefined references.' fi
    if @multiplelabels = true
    then LaTeX Warning:
      'One or more label(s) multiply defined.'
    else
      \@setckpt {ARG1}{ARG2} == null
      \newlabel{LABEL}{VAL} ==
      BEGIN
        \reserved@a == VAL
        if def(\reserved@a) = def(\r@LABEL)
        else @tempswa := true          fi
      END
      \bibcite{LABEL}{VAL} == null
      BEGIN
        \reserved@a == VAL
        if def(\reserved@a) = def(\g@LABEL)
        else @tempswa := true          fi
      END
    fi
  fi
\endgroup
```

```

                                END
                                @tempswa := false
                                make @ a letter
                                \input \jobname.AUX
                                if @tempswa = true
                                    then LaTeX Warning: 'Label may have changed.
                                                Rerun to get cross-references right.'
                                fi
                                fi
                                fi
                                \endgroup
                                finish up
                                END

                                \@writefile{EXT}{ENTRY} ==
                                    if tf@EXT undefined
                                        else \write\tf@EXT{ENTRY}
                                    fi
                                End of historical LATEX 2.09 comments.

\currentenvir The name of the current environment. Initialized to document to so that \end{document}
works correctly.
3 \def\currentenvir{document}

(End definition for \currentenvir.)

\if@ignore
\@ignoretrue 4 \def\@ignorefalse{\global\let\if@ignore\iffalse}
\@ignorefalse 5 \def\@ignoretrue {\global\let\if@ignore\iftrue}
6 \@ignorefalse

(End definition for \if@ignore, \@ignoretrue, and \@ignorefalse.)

\ignorespacesafterend
7 \let\ignorespacesafterend\@ignoretrue

(End definition for \ignorespacesafterend.)

\enddocument
8 </2kernel>
9 <*2kernel | latexrelease>
10 <latexrelease>\IncludeInRelease{2020/10/01}%
11 <latexrelease> {\enddocument}{Use Hooks}%
12 \def\enddocument{%

The \end{document} hook is executed first. If necessary it can contain a \clearpage to
output dangling floats first. In this position it can also contain something like \end{foo}
so that the whole document effectively starts and ends with some special environment.
However, this must be used with care, eg if two applications would use this without knowl-
edge of each other the order of the environments will be wrong after all. \AtEndDocument
is redefined at this point so that and such commands that get into the hook do not chase
their tail...

13 \@kernel@before@enddocument
14 \UseOneTimeHook{enddocument}%
15 \@kernel@after@enddocument

```

```

16 \checkend{document}%
17 \clearpage
18 \UseOneTimeHook{enddocument/afterlastpage}%
19 \@kernel@after@enddocument@afterlastpage
20 \begin{group}
21   \if@filesw
22     \immediate\closeout\@mainaux
23     \let\@setckpt\@gobbletwo
24     \let\@newl@bel\@testdef

```

The previous line is equiv to setting

```

\def\newlabel{\@testdef r}%
\def\bibcite{\@testdef b}%

```

We use `\@input` to load the `.aux` file, so that it doesn't show up in the list of files produced by `\listfiles`.

```

25 \tempwafalse
26 \makeatletter \@input\jobname.aux
27 \fi
28 \UseOneTimeHook{enddocument/afteraux}%

```

Next hook is expect to contain only code for writing info messages on the terminal.

```

29 \UseOneTimeHook{enddocument/info}%
30 \endgroup
31 \UseOneTimeHook{enddocument/end}%
32 \deadcycles\z@%

```

The public hooks used in `\enddocument`:

```

33 \NewHook{enddocument}
34 \NewHook{enddocument/afterlastpage}
35 \NewHook{enddocument/afteraux}
36 \NewHook{enddocument/info}
37 \NewHook{enddocument/end}

```

This is one of the few places where we already add data and rules to a hook already in the kernel.

```

38 \AddToHook{enddocument/info}[kernel/filelist]{\@dofilelist}
39 \AddToHook{enddocument/info}[kernel/warnings]{\@enddocument@kernel@warnings}
40 \DeclareHookRule{enddocument/info}{kernel/filelist}{before}{kernel/warnings}

```

*(End definition for \enddocument.)*

`\@enddocument@kernel@warnings`

```

41 \def\@enddocument@kernel@warnings{%

```

First we check for font size substitution bigger than `\fontsubfuzz`. The `\relax` is necessary because this is a macro not a register.

```

42 \ifdim \font@submax >\fontsubfuzz\relax

```

In case you wonder about the `\@gobbletwo` inside the message below, this is a horrible hack to remove the tokens `\on@line`. that are added by `\@font@warning` at the end.

```

43 \font@warning{Size substitutions with differences\MessageBreak
44             up to \font@submax\space have occurred.\@gobbletwo}%
45 \fi

```

The macro `\@defaultsubs` is initially `\relax` but gets redefined to produce a warning if there have been some default font substitutions.

```
46 \@@defaultsubs
```

The macro `\@refundefined` is initially `\relax` but gets redefined to produce a warning if there are undefined refs.

```
47 \@@refundefined
```

If a label is defined more than once, `\@tempswa` will always be true and thus produce a “Label(s) may ...” warning. But since a rerun will not solve that problem (unless one uses a package like `varioref` that generates labels on the fly), we suppress this message.

```
48 \if@filesw
49   \ifx \@multiplelabels \relax
50     \if@tempswa
51       \@latex@warning@no@line{Label(s) may have changed.
52         Rerun to get cross-references right}%
53     \fi
54   \else
55     \@multiplelabels
56   \fi
57   \ifx \@extra@page@added \relax
58     \@latex@warning@no@line{Temporary extra page added at the end.
59       Rerun to get it removed}%
60   \fi
```

We could think of adding a warning that nothing can be corrected while `\nofiles` is in force. In the past the warnings related to the aux file are simply suppressed in this case.

```
61 \fi
62 }
```

(End definition for `\@enddocument@kernel@warnings.`)

```
63 </2ekernel | latexrelease>
64 <latexrelease>\EndIncludeInRelease
65 <latexrelease>\IncludeInRelease{0000/00/00}%
66 <latexrelease>          {\enddocument}{Use Hooks}%
67 <latexrelease>
68 <latexrelease>\def\enddocument{%
69 <latexrelease>  \let\AtEndDocument\@firstofone
70 <latexrelease>  \@enddocumenthook
71 <latexrelease>  \@checkend{document}%
72 <latexrelease>  \clearpage
73 <latexrelease>  \begingroup
74 <latexrelease>    \if@filesw
75 <latexrelease>      \immediate\closeout\@mainaux
76 <latexrelease>      \let\@setckpt\@gobbletwo
77 <latexrelease>      \let\@newl@bel\@testdef
78 <latexrelease>      \@tempwafalse
79 <latexrelease>      \makeatletter \@@input\jobname.aux
80 <latexrelease>    \fi
81 <latexrelease>    \@dofilelist
82 <latexrelease>    \ifdim \font@submax >\fontsubfuzz\relax
83 <latexrelease>      \@font@warning{Size substitutions with differences\MessageBreak
84 <latexrelease>        up to \font@submax\space have occurred.\@gobbletwo}%
```

```

85 <latexrelease> \fi
86 <latexrelease> \@defaultsubs
87 <latexrelease> \@refundefined
88 <latexrelease> \if@filesw
89 <latexrelease> \ifx \@multiplelabels \relax
90 <latexrelease> \if@tempswa
91 <latexrelease> \latex@warning@no@line{Label(s) may have changed.
92 <latexrelease> Rerun to get cross-references right}%
93 <latexrelease> \fi
94 <latexrelease> \else
95 <latexrelease> \@multiplelabels
96 <latexrelease> \fi
97 <latexrelease> \fi
98 <latexrelease> \endgroup
99 <latexrelease> \deadcycles\z@\@end}
100 <latexrelease>
101 <latexrelease>\let\@enddocument@kernel@warnings\@undefined
102 <latexrelease>
103 <latexrelease>\EndIncludeInRelease
104 <*2ekernel>

```

`\@kernel@before@enddocument` The `\@kernel@before@enddocument` hook is slightly different because we initialize it with `\par` so that `\enddocument` always returns to vertical mode as its first action.

```

105 </2ekernel>
106 <*2ekernel | latexrelease>
107 <latexrelease>\IncludeInRelease{2021/06/01}%
108 <latexrelease> \{\@kernel@before@enddocument\}{kernel before hook}%
109 <def\@kernel@before@enddocument\{\par>
110 </2ekernel | latexrelease>
111 <latexrelease>\EndIncludeInRelease
112 <latexrelease>\IncludeInRelease{0000/00/00}%
113 <latexrelease> \{\@kernel@before@enddocument\}{kernel before hook}%
114 <latexrelease>
115 <latexrelease>\let\@kernel@before@enddocument\@empty
116 <latexrelease>
117 <latexrelease>\EndIncludeInRelease
118 <*2ekernel>

```

*(End definition for \@kernel@before@enddocument.)*

`\@testdef`

```

119 \def\@testdef #1#2#3{%
120 \def\reserved@a{#3}\expandafter \ifx \csname #1@#2\endcsname
121 \reserved@a \else \@tempwattrue \fi}

```

*(End definition for \@testdef.)*

Reading data from auxiliary files (like `.toc` normally happens in vertical mode and it therefore doesn't matter if line endings are converted to spaces by  $\text{\TeX}$  during that process.

However, especially the `.toc` file might be read in L-R mode (in cases the `\tableofcontents` attempts to put, say a list of sub-sections as a paragraph. In that case the newlines after a line like

`\contentsline {subsubsection}{\numberline {1.1.1}A C-head}{2}`

might result in spurious spaces (e.g., when that level is not included).

That could be fixed by reading in the file using `\endlinechar=-1` but that has the danger that it drops some valid endlines that should be converted to spaces (for example when the user edited the TOC and then used `\nofiles` to preserve it).

So the approach taken instead is this:

- `\addcontentsline` adds the command `\protected@file@percent` to the end of the second argument of `\@writefile` that is written to the `.aux`. As the name indicates this is a protected macro so it doesn't change if it is written out.
- When the `.aux` is read back in at the end of the run, `\@writefile` is executed and writes its second argument unmodified to the file with the extension given by its first argument. Or rather that was how it was in the past.
- Instead we change `\@writefile` slightly: basically it looks at the second argument and if the last token in there is `\protected@file@percent` then it is replaced by a percent character and that is then written out. If not (for example, if the data came from a user issued `\addtocontents`, or from some package that uses `\@writefile` for writing its own files) then the command behaves exactly as before.

`\protected@file@percent` Dummy cs to be replaced by a percent sign inside `\@writefile`. If it survives (when used incorrectly) it will expand to nothing in a typesetting context.

```

122 </2ekernel>
123 <*2ekernel | latexrelease>
124 <latexrelease>\IncludeInRelease{2018/12/01}%
125 <latexrelease>          {\protected@file@percent}{Mask line endings}%
126 \protected\def\protected@file@percent{}

```

*(End definition for \protected@file@percent.)*

`\add@percent@to@temptokena` Helper function which is used to inspect a sequence of tokens (the second argument of `\@writefile` and if the last token is `\protected@file@percent` it will replace it by a harmless percent. The result is saved in `\@temptokena` for later use.

```

127 \catcode'\^^A=9
128 \long\gdef\add@percent@to@temptokena
129   #1\protected@file@percent#2\add@percent@to@temptokena

```

When we call this macro in `\@writefile` we stick in `\@empty` at the beginning, so that in case the tokenlist consists of a single brace group the braces aren't stripped. The `\expandafter` then expands this extra token away again.

```

130   {\expandafter\ifx\expandafter X\detokenize{#2}X\expandafter\dont@add@percent@to@temptokena
131     \expandafter\do@add@percent@to@temptokena\fi{#1}}
132 \long\def\dont@add@percent@to@temptokena#1{%
133   \@temptokena\expandafter{#1}}

```

`latexrelease` will read this code in high-speed mode in certain situations. During that it will only look for `\if` tests but not actually execute the `\catcode` change above. As a result it will drop anything after the `%` character in the definition. Therefore the `\fi` needs to be on the next line and we need locally another comment character to avoid getting spaces into the definition—a weird problem :-)

```

134 \begingroup

```

```

135 \catcode'\%=12
136 \catcode'\^^A=14
137 \long\gdef\do@add@percent@to@temptokena#1{\@temptokena\expandafter{#1%\^^A

```

Can't be on the same line as the % — see above.

```

138   }}
139 \endgroup

```

(End definition for \add@percent@to@temptokena.)

\@writefile

```

140 \long\def\@writefile#1#2{%
141   \@ifundefined{tf@#1}\relax
142   {%

```

If we write to the file we first prepare #2 using \add@percent@to@temptokena and then write the token register out.

```

143     \add@percent@to@temptokena
144     \@empty#2\protected@file@percent
145     \add@percent@to@temptokena
146     \immediate\write\csname tf@#1\endcsname{\the\@temptokena}%
147   }%
148 }

149 </2ekernel | latexrelease>
150 <latexrelease>\EndIncludeInRelease
151 <latexrelease>\IncludeInRelease{0000/00/00}%
152 <latexrelease>          {\protected@file@percent}{Mask line endings}%
153 <latexrelease>\let\protected@file@percent\@undefined
154 <latexrelease>\let\add@percent@to@temptokena\@undefined
155 <latexrelease>\let\do@add@percent@to@temptokena\@undefined
156 <latexrelease>\let\dont@add@percent@to@temptokena\@undefined
157 <latexrelease>\long\def\@writefile#1#2{%
158 <latexrelease>   \@ifundefined{tf@#1}\relax
159 <latexrelease>   {\@temptokena{#2}%
160 <latexrelease>     \immediate\write\csname tf@#1\endcsname{\the\@temptokena}%
161 <latexrelease>   }%
162 <latexrelease>}
163 <latexrelease>\EndIncludeInRelease
164 <*2ekernel>

```

(End definition for \@writefile.)

\stop

```

165 \def\stop{\clearpage\deadcycles\z@\let\par\@@par\@@end}

```

(End definition for \stop.)

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

```

166 \everypar{\@nodocument} %% To get an error if text appears before the
167 \nullfont                %% \begin{document}

```



`\begin`, `\end`, and `\@checkend` changed so `\end{document}` will catch an unmatched `\begin`. Changed 24 May 89 as suggested by Frank Mittelbach and Rainer Sch\"opf.

```

\begin{NAME} ==
BEGIN
  IF \NAME undefined THEN \reserved@a == BEGIN report error END
                        ELSE \reserved@a ==
                            (\@currentvir :=L NAME) \NAME
  FI
  @ignore :=G F      %% Added 30 Nov 88
  \begingroup
  \@endpe := F
  \@currentvir :=L NAME
  \NAME
END

\end{NAME} ==
BEGIN
  \endNAME
  \@checkend{NAME}
  \endgroup
  IF @endpe = T      %% @endpe set True by \@endparenv
    THEN \@doendpe   %% \@doendpe redefines \par and \everypar
                    %% to suppress paragraph indentation in
                    %% immediately following text
  FI
  IF @ignore = T
    THEN @ignore :=G F
        \ignorespaces
  FI
END

\@checkend{NAME} ==
BEGIN
  IF \@currentvir = NAME
    ELSE \@badend{NAME}
  FI
END

```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

```

\begin
168 </2kernel>
169 <*2kernel | latexrelease>
170 <latexrelease>\IncludeInRelease{2020/10/01}%
171 <latexrelease>          {\begin}{Use hook system}%
172 \DeclareRobustCommand*\begin[1]{%
173   \UseHook{env/#1/before}%
174   \@ifundefined{#1}%

```

```

175     {\def\reserved@a{\@latex@error{Environment #1 undefined}\@eha}}%
176     {\def\reserved@a{\def\@currentvir{#1}%
177       \edef\@currentvline{\on@line}%
178       \@execute@begin@hook{#1}%
179       \csname #1\endcsname}}%
180     \ignorefalse
181     \begingroup\@endpefalse\reserved@a}

```

Before the `\document` code is executed we have to first undo the `\endgroup` as there should be none for this environment to avoid that changes on top-level unnecessarily go to TeX's savestack, and we have to initialize all hooks in the hook system. So we need to test for this environment name. But once it has been found all this testing is no longer needed and so we redefine `\@execute@begin@hook` to simply use the hook.

```

182 \def\@execute@begin@hook #1{%
183   \expandafter\ifx\csname #1\endcsname\document
184     \endgroup
185     \gdef\@execute@begin@hook##1{\UseHook{env/##1/begin}}%
186     \expl@@@initialize@all@@
187   \fi

```

If this is an environment before `\begin{document}` we just run the hook so this can be outside the test.

```

188   \UseHook{env/#1/begin}%
189 }

```

The top level definition for `\end.` for an explanation see below (this is the same as the 2019 version where it was introduced, but for rollback we have to repeat it).

```

190 \edef\end
191   {\unexpanded{%
192     \romannumeral
193     \ifx\protect\@typeset@protect
194       \expandafter %1
195       \expandafter %2
196       \expandafter %1
197       \expandafter %3 expands the \csname inside \end<space>
198       \expandafter %1
199       \expandafter %2 expands \end<space>
200       \expandafter %1 expands the \else
201       \z@
202     \else
203       \expandafter\z@\expandafter\protect
204     \fi
205   }%
206   \expandafter\noexpand\csname end \endcsname
207 }

```

Version that adds hooks (so different from the 2019 version). It fixes tlb3722 but the change should perhaps be made in `tabularx` instead.

```

208 \@namedef{end }#1{%
209   \romannumeral
210   \IfHookEmptyTF{env/#1/end}%
211     {\expandafter\z@}%
212     {\z@\UseHook{env/#1/end}}%
213   \csname end#1\endcsname\@checkend{#1}%
214   \expandafter\endgroup\if@endpe\@doendpe\fi

```

```

215 \UseHook{env/#1/after}%
216 \if@ignore\@ignorefalse\ignorespaces\fi
217 }

```

Version without the fix for tlb3722 for the record:

```

218 %\@namedef{end }#1{%
219 % \UseHook{env/#1/end}%
220 % \csname end#1\endcsname\@checkend{#1}%
221 % \expandafter\endgroup\if@endpe\@doendpe\fi
222 % \UseHook{env/#1/after}%
223 % \if@ignore\@ignorefalse\ignorespaces\fi}%
224 </2ekernel | latexrelease>
225 <latexrelease>\EndIncludeInRelease
226 <latexrelease>\IncludeInRelease{2019/10/01}%
227 <latexrelease> \begin}{Making \begin/\end robust}%
228 <latexrelease>\DeclareRobustCommand\begin[1]{%
229 <latexrelease> \ifundefined{#1}%
230 <latexrelease> {\def\reserved@a{\@latex@error{Environment #1 undefined}\@eha}}%
231 <latexrelease> {\def\reserved@a{\def\@currentvir{#1}%
232 <latexrelease> \edef\@currentvline{\on@line}%
233 <latexrelease> \csname #1\endcsname}}%
234 <latexrelease> \@ignorefalse
235 <latexrelease> \begingroup\@endpfalse\reserved@a}

```

A version that doesn't start out with `\relax` when in typesetting mode would be the following, but since `\begin` issues a `\begingroup` it wouldn't help much with respect to allowing things like `\noalign` or `\multicolumn` inside.

```

236 %\edef\begin
237 % {\unexpanded{%
238 % \ifx\protect\@typeset@protect
239 % \expandafter\@gobble
240 % \fi
241 % \protect
242 % }%
243 % \expandafter\noexpand\csname begin \endcsname
244 % }
245 %\@namedef{begin }#1{%
246 % \ifundefined{#1}%
247 % {\def\reserved@a{\@latex@error{Environment #1 undefined}\@eha}}%
248 % {\def\reserved@a{\def\@currentvir{#1}%
249 % \edef\@currentvline{\on@line}%
250 % \csname #1\endcsname}}%
251 % \@ignorefalse
252 % \begingroup\@endpfalse\reserved@a}

```

While `\begin` was made robust simply by using `\DeclareRobustCommand` we need to be a bit more subtle with `\end` as there are packages out there that try to look into the top-level contents of `\end{foo}` (that is at the expansion of `\endfoo`) to see if it contains certain macros. This is done by hitting `\end{foo}` with three `\expandafters`, the first to get

```
\csname endfoo\endcsname \@checkend{foo}% etc.
```

the second to expand the `\csname`, i.e., to get to

```
\endfoo                                \@checkend{foo}% etc.
```

and the third to finally get to the top-level content of `\endfoo`, i.e.

```
<top-level content of \endfoo> \@checkend{foo}% etc.
```

Therefore a robust replacement should produce the same results after three expansions (there first is obviously different).

Basically the definition of `\end` should either produce `\protect\end_` (when not doing typesetting) or it should produce `\end_` (without the `\protect`) when doing typesetting. Furthermore, it should (when in typesetting mode) show exactly the same result as `\end_` (which is the original fragile definition of `\end`) when you expand either of them twice, i.e.,

```
\endfoo                                \@checkend{foo}% etc.
```

That is achieved with the code below (which is worth studying carefully).

There is some trickery involved here: in particular we use `\romannumeral` to change a single expansion into three successive expansions in one go. That primitive expands until it has scanned a number (0 in this case, so it doesn't produce any output) and so it allows us to place arbitrary many `\expandafter` inside that are all going to be executed when `\romannumeral` is hit by a single `\expandafter`.

```
253 <latexrelease>\edef\end
254 <latexrelease>  {\unexpanded{%
255 <latexrelease>    \romannumeral
256 <latexrelease>    \ifx\protect\@typeset@protect
257 <latexrelease>    \expandafter      %1
258 <latexrelease>    \expandafter      %2
259 <latexrelease>    \expandafter      %1
260 <latexrelease>    \expandafter      %3 expands the \cename inside \end<space>
261 <latexrelease>    \expandafter      %1
262 <latexrelease>    \expandafter      %2 expands \end<space>
263 <latexrelease>    \expandafter      %1 expands the \else
264 <latexrelease>    \z@
265 <latexrelease>    \else
266 <latexrelease>    \expandafter\z@\expandafter\protect
267 <latexrelease>    \fi
268 <latexrelease>  }%
269 <latexrelease>  \expandafter\noexpand\cename end \endcename
270 <latexrelease>  }
```

And here is the original definition of `\end` the way it was in L<sup>A</sup>T<sub>E</sub>X for several decades now hidden in `\end_`.

```
271 <latexrelease>\@namedef{end }#1{%
272 <latexrelease>  \cename end#1\endcename\@checkend{#1}%
273 <latexrelease>  \expandafter\endgroup\if@endpe\@doendpe\fi
274 <latexrelease>  \if@ignore\@ignorefalse\ignorespaces\fi}
275 <latexrelease>\EndIncludeInRelease
```

And here the rollback in case that is ever needed.

```
276 <latexrelease>\IncludeInRelease{0000/00/00}%
277 <latexrelease>    {\begin}{Making \begin/\end robust}%
278 <latexrelease>\def\begin#1{%
279 <latexrelease>  \@ifundefined{#1}%
```

```

280 <latexrelease>      {\def\reserved@a{\@latex@error{Environment #1 undefined}\@eha}}%
281 <latexrelease>      {\def\reserved@a{\def\@currentvir{#1}%
282 <latexrelease>        \edef\@currentvline{\on@line}%
283 <latexrelease>        \csname #1\endcsname}}%
284 <latexrelease>      \ignorefalse
285 <latexrelease>      \begingroup\@endpfalse\reserved@a}
286 <latexrelease>\def\end#1{%
287 <latexrelease>      \csname end#1\endcsname\@checkend{#1}%
288 <latexrelease>      \expandafter\endgroup\if@endpe\@doendpe\fi
289 <latexrelease>      \if@ignore\ignorefalse\ignorespaces\fi}
290 <latexrelease>

```

Also undo the internal commands as some packages unfortunately test for their existence instead of using `\IfFormatAtLeastTF`.

```

291 <latexrelease>\expandafter\let\csname begin \endcsname\@undefined
292 <latexrelease>\expandafter\let\csname end \endcsname\@undefined
293 <latexrelease>
294 <latexrelease>\EndIncludeInRelease
295 <*2ekernel>

```

(End definition for `\begin` and `\end`.)

`\@checkend`

```

296 \def\@checkend#1{\def\reserved@a{#1}\ifx
297     \reserved@a\@currentvir \else\@badend{#1}\fi}

```

(End definition for `\@checkend`.)

`\@currentvline` We do need a default value for `\@currentvline` on top-level since the document environment cancels the brace group. This means that a mismatch with `\begin{document}` will not produce a line number. Thus the outer default must be `\@empty` or we will end up with two spaces.

```

298 \let\@currentvline\@empty

```

(End definition for `\@currentvline`.)

`\AtBeginEnvironment` We provide 4 high-level hook interfaces directly, the others only when etoolbox is loaded

`\AtEndEnvironment`

`\BeforeBeginEnvironment`

`\AfterEndEnvironment`

```

299 </2ekernel>
300 <*2ekernel | latexrelease>
301 <latexrelease>\IncludeInRelease{2020/10/01}%
302 <latexrelease>      {\AtBeginEnvironment}{Hooks for environments}%
303 \newcommand\AtBeginEnvironment[2][.]    {\AddToHook{env/#2/begin}[#1]}
304 \newcommand\AtEndEnvironment[2][.]      {\AddToHook{env/#2/end}[#1]}
305 \newcommand\BeforeBeginEnvironment[2][.]{\AddToHook{env/#2/before}[#1]}
306 \newcommand\AfterEndEnvironment[2][.]   {\AddToHook{env/#2/after}[#1]}
307 </2ekernel | latexrelease>
308 <latexrelease>\EndIncludeInRelease
309 <latexrelease>\IncludeInRelease{0000/00/00}%
310 <latexrelease>      {\AtBeginEnvironment}{Hooks for environments}%
311 <latexrelease>
312 <latexrelease>\let\AtBeginEnvironment\@undefined
313 <latexrelease>\let\AtEndEnvironment\@undefined
314 <latexrelease>\let\BeforeBeginEnvironment\@undefined

```

```

315 <latexrelease>\let\AfterEndEnvironment\@undefined
316 <latexrelease>
317 <latexrelease>\EndIncludeInRelease
318 <*2ekernel>

```

(End definition for `\AtBeginEnvironment` and others. These functions are documented on page 200.)

## 1.2 Center, Flushright, Flushleft

```

319 \message{center,}

```

Historical *LaTeX 2.09* comments (not necessarily accurate any more):

```

\center, \flushright and \flushleft set
  \rightskip = 0pt or \@flushglue (as appropriate)
  \leftskip  = 0pt or \@flushglue (as appropriate)
  \parindent = 0pt
  \parfillskip = 0pt. (except \flushleft)
  \\\          == \par \vskip -\parskip
  \|[LENGTH] == \\\ \vskip LENGTH
  \\\*         == \par \penalty 10000 \vskip -\parskip
  \\\*[LEN]    == \\\* \vskip LENGTH

```

They invoke the `trivlist` environment to handle vertical spacing before and after them.

`\centering`, `\raggedright` and `\raggedleft` are the declaration analogs of the above.

`\raggedright` has a more universal effect, however. It sets `\@rightskip := flushglue`. Every environment, like the list environments, that set `\rightskip` to its 'normal' value set it to `\@rightskip`

End of historical *LaTeX 2.09* comments.

`\@centercr`

```

320 </2ekernel>
321 <*2ekernel | latexrelease>
322 <latexrelease>\IncludeInRelease{2020/02/02}%
323 <latexrelease>          {\@centercr}{Make robust}%
324 \protected\def\@centercr{\ifhmode \unskip\else \@nolnerr\fi
325   \par\@ifstar{\nobreak\@xcentercr}\@xcentercr}
326 </2ekernel | latexrelease>

327 <latexrelease>\EndIncludeInRelease
328 <latexrelease>\IncludeInRelease{0000/00/00}%
329 <latexrelease>          {\@centercr}{Make robust}%
330 <latexrelease>
331 <latexrelease>\def\@centercr{\ifhmode \unskip\else \@nolnerr\fi
332 <latexrelease>          \par\@ifstar{\nobreak\@xcentercr}\@xcentercr}
333 <latexrelease>
334 <latexrelease>\EndIncludeInRelease
335 <*2ekernel>

```

```

(End definition for \@centercr.)

\@xcentercr
336 \def\@xcentercr{\addvspace{-\parskip}\@ifnextchar
337   [\@icentercr\ignorespaces}

(End definition for \@xcentercr.)

\@icentercr
338 \</2ekernel>
339 \<*2ekernel | latexrelease>
340 \<latexrelease>\IncludeInRelease{2020/10/01}%
341 \<latexrelease>          {\@icentercr}{centering, etc support calc}%
342 \def\@icentercr[#1]{\@vspace@calcify{#1}\ignorespaces}
343 \</2ekernel | latexrelease>
344 \<latexrelease>\EndIncludeInRelease
345 \<latexrelease>\IncludeInRelease{0000/00/00}%
346 \<latexrelease>          {\@icentercr}{centering, etc support calc}%
347 \<latexrelease>
348 \<latexrelease>\def\@icentercr[#1]{\vskip #1\ignorespaces}
349 \<latexrelease>\EndIncludeInRelease
350 \<*2ekernel>

(End definition for \@icentercr.)

center (env.) We use \relax to prevent \item scanning too far.
351 \def\center{\trivlist \centering\item\relax}
352 \def\endcenter{\endtrivlist}

353 \</2ekernel>
354 \<*2ekernel | latexrelease>
355 \<latexrelease>\IncludeInRelease{2020/10/01}%
356 \<latexrelease>          {\centering}{Set finaldhyphendemerits}%

\centering
357 \DeclareRobustCommand\centering{%
358   \let\\ \@centercr
359   \rightskip\@flushglue\leftskip\@flushglue
360   \finalhyphendemerits=\z@
361   \parindent\z@\parfillskip\z@skip}

(End definition for \centering.)

\raggedright
362 \DeclareRobustCommand\raggedright{%
363   \let\\ \@centercr\@rightskip\@flushglue \rightskip\@rightskip
364   \finalhyphendemerits=\z@
365   \leftskip\z@skip
366   \parindent\z@}

(End definition for \raggedright.)

```

`\raggedleft`

```
367 \DeclareRobustCommand\raggedleft{%
368   \let\\\@centercr
369   \rightskip\z@skip\leftskip\@flushglue
370   \finalhyphendemerits=\z@
371   \parindent\z@\parfillskip\z@skip}

(End definition for \raggedleft.)

372 </2kernel | latexrelease>
373 <latexrelease>\EndIncludeInRelease
374 <latexrelease>\IncludeInRelease{2019/10/01}%
375 <latexrelease>           {\centering}{Make commands robust}%
376 <latexrelease>
377 <latexrelease>\DeclareRobustCommand\centering{%
378 <latexrelease>   \let\\\@centercr
379 <latexrelease>   \rightskip\@flushglue\leftskip\@flushglue
380 <latexrelease>   \parindent\z@\parfillskip\z@skip}
381 <latexrelease>\DeclareRobustCommand\raggedright{%
382 <latexrelease>   \let\\\@centercr\@rightskip\@flushglue \rightskip\@rightskip
383 <latexrelease>   \leftskip\z@skip
384 <latexrelease>   \parindent\z@}
385 <latexrelease>\DeclareRobustCommand\raggedleft{%
386 <latexrelease>   \let\\\@centercr
387 <latexrelease>   \rightskip\z@skip\leftskip\@flushglue
388 <latexrelease>   \parindent\z@\parfillskip\z@skip}
389 <latexrelease>\EndIncludeInRelease
390 <latexrelease>
391 <latexrelease>\IncludeInRelease{0000/00/00}%
392 <latexrelease>           {\centering}{Make commands robust}%
393 <latexrelease>
394 <latexrelease>\kernel@make@fragile\centering
395 <latexrelease>\kernel@make@fragile\raggedright
396 <latexrelease>\kernel@make@fragile\raggedleft
397 <latexrelease>
398 <latexrelease>\EndIncludeInRelease
399 <*2kernel>
```

`\@rightskip`

```
400 \newskip\@rightskip \@rightskip \z@skip
```

(End definition for \@rightskip.)

`flushleft` (*env.*) We use `\relax` to prevent `\item` scanning too far.

```
401 \def\flushleft{\trivlist \raggedright\item\relax}
402 \def\endflushleft{\endtrivlist}
```

`flushright` (*env.*) We use `\relax` to prevent `\item` scanning too far.

```
403 \def\flushright{\trivlist \raggedleft\item\relax}
404 \def\endflushright{\endtrivlist}
```



### 1.3 Verbatim

405 \message{verbatim,}

The verbatim environment uses the fixed-width `\ttfamily` font, turns blanks into spaces, starts a new line for each carriage return (or sequence of consecutive carriage returns), and interprets *every* character literally. I.e., all special characters `\`, `{`, `$`, etc. are `\catcode'd` to 'other'.

The command `\verb` produces in-line verbatim text, where the argument is delimited by any pair of characters. E.g., `\verb #...#` takes '...' as its argument, and sets it verbatim in `\ttfamily` font.

The \*-variants of these commands are the same, except that spaces print as the TeXbook's space character instead of as blank spaces.

`\@vobeyspaces`

406 {\catcode'\ =\active%  
407 \gdef\@vobeyspaces{\catcode'\ \active\let \@xobeysp}}

(End definition for \@vobeyspaces.)

`\@xobeysp`

(End definition for \@xobeysp.)

`\@xverbatim`

`\@sxverbatim`

408 \begingroup \catcode '|=0 \catcode '[= 1  
409 \catcode']=2 \catcode '\{=12 \catcode '\}=12  
410 \catcode'\}=12 \gdef\@xverbatim#1\end{verbatim}[#1\end[verbatim]]  
411 \gdef\@sxverbatim#1\end{verbatim\*}[#1\end[verbatim\*]]  
412 \endgroup

(End definition for \@xverbatim and \@sxverbatim.)

`\@verbatim` Real start of verbatim environment We use `\relax` to prevent `\item` scanning too far.

413 </2kernel>  
414 <\*2kernel | latexrelease>  
415 <latexrelease>\IncludeInRelease{2017-04-15}{\@verbatim}%  
416 <latexrelease> {Disable hyphenation in verbatim}%  
417 \def\@verbatim{\trivlist \item\relax  
418 \if@minipage\else\vskip\parskip\fi  
419 \leftskip\@totalleftmargin\rightskip\z@skip  
420 \parindent\z@\parfillskip\@flushglue\parskip\z@skip

Added `\@@par` to clear possible `\parshape` definition from a surrounding list (the verbatim guru says). Switch language when in vertical mode.

421 \@@par

Set `\language` here to suppress hyphenation. Done this way rather than setting `\hyphenchar` as that is a global setting.

422 \language\l@nohyphenation  
423 \@tempwafalse  
424 \def\par{%  
425 \if@tempswa

A `\leavevmode` added: needed if, for example, a blank verbatim line is the first thing in a list item (wow!).

```

426     \leavevmode \null \@@par\penalty\interlinepenalty
427   \else
428     \@tempswatrue
429     \ifhmode\@@par\penalty\interlinepenalty\fi
430   \fi}%

```

To allow customization we hide the font used in a separate macro.

```

431   \let\do\@makeother \dospecials
432   \obeylines \verbatim@font \@noligs

```

To avoid a breakpoint after the labels box, we remove the penalty put there by the list macros: another use of `\unpenalty`!

```

433   \everypar \expandafter{\the\everypar \unpenalty}%
434 }
435 </2ekernel | latexrelease>
436 <latexrelease>\EndIncludeInRelease
437 <latexrelease>\IncludeInRelease{0000-00-00}{\@verbatim}%
438 <latexrelease>           {Disable hyphenation in verbatim}%
439 <latexrelease>\def\@verbatim{\trivlist \item\relax
440 <latexrelease>  \if@minipage\else\vskip\parskip\fi
441 <latexrelease>  \leftskip\@totalleftmargin\rightskip\z@skip
442 <latexrelease>  \parindent\z@\parfillskip\@flushglue\parskip\z@skip
443 <latexrelease>  \@@par
444 <latexrelease>  \@tempswafalse
445 <latexrelease>  \def\par{%
446 <latexrelease>    \if@tempswa
447 <latexrelease>      \leavevmode \null \@@par\penalty\interlinepenalty
448 <latexrelease>    \else
449 <latexrelease>      \@tempswatrue
450 <latexrelease>      \ifhmode\@@par\penalty\interlinepenalty\fi
451 <latexrelease>    \fi}%
452 <latexrelease>  \let\do\@makeother \dospecials
453 <latexrelease>  \obeylines \verbatim@font \@noligs
454 <latexrelease>  \hyphenchar\font\m@ne
455 <latexrelease>  \everypar \expandafter{\the\everypar \unpenalty}%
456 <latexrelease>}
457 <latexrelease>\EndIncludeInRelease
458 <*2ekernel>

```

(End definition for `\@verbatim`.)

`\verbatim@font` (RmS 93/09/19) Protected against ‘missing item’ error message triggered by empty verbatim environment.

```

459 \def\verbatim{\@verbatim \frenchspacing\@vobeyspaces \@xverbatim}
460 \def\endverbatim{\if@newlist \leavevmode\fi\endtrivlist}

```

(End definition for `\verbatim` and `\endverbatim`.)

`\verbatim@font` Macro to select the font used for verbatim typesetting. It also does other work if necessary for the font used.

```

461 \def\verbatim@font{\normalfont\ttfamily}

```

(End definition for \verbatim@font.)

```
462 \endkernel
463 \ifx\kernel\latexrelease
464 \ifx\kernel\includeinrelease{2018/12/01}%
465 \ifx\kernel\includeinrelease{\verbvisiblespace}{Setup visible space for \verb}%
```

**\asciispace** The character in slot 32, in typewriter fonts (historically) a visible space but in other fonts a real space or something else

```
466 \DeclareRobustCommand\asciispace{\char 32 }
```

(End definition for \asciispace.)

**\verbvisiblespace** This defines how to get a visible space in **\verb\*** and friends. In classic T<sub>E</sub>X this is just the slot 32, but in T<sub>U</sub> encoded fonts we switch fonts and take the character from cmtt.

```
467 \ifx\Umathcode\@undefined
468 \let\verbvisiblespace\asciispace % Pdftex version
469 \else
470 \DeclareRobustCommand\verbvisiblespace
471 {\leavevmode{\usefont{OT1}{cmtt}{m}{n}\asciispace}} % xetex/luatex version
472 \fi
```

(End definition for \verbvisiblespace.)

**\@setupverbvisiblespace** In pdfT<sub>E</sub>X a catcode 12 space will produce the character in slot 32 which is assumed to be a visible space character (in a typewriter font in OT1 or T1 encoding). In XeT<sub>E</sub>X or LuaT<sub>E</sub>X a font in T<sub>U</sub> encoding is normally used and that has a real space in this slot. So what we do in this case is this: we check the definition of **\verbvisiblespace** and if it is **\asciispace** we assume that the char32 can be used (e.g., in pdfT<sub>E</sub>X). We then redefine **\@xobeysp** so that after running **\@xobeyspaces** we get characters from slot 32 for each active space.

```
473 \def\@setupverbvisiblespace{%
474 \ifx\verbvisiblespace\asciispace
475 \let\@xobeysp\asciispace
476 \else
```

Otherwise we measure the width of a character in the mon-spaced current font and place a **\verbvisiblespace** into a box of the right width which we are then using as the character for a space. By default this will be the space character from OT1 cmtt but by changing **\verbvisiblespace** one could use, for example, the **\textvisiblespace** of the current typewriter font.

```
477 \setbox\z@\hbox{x}%
478 \setbox\@verbvisiblespacebox\hbox to\wd\z@{\hss\verbvisiblespace\hss}%
479 \def\@xobeysp{\leavevmode\copy\@verbvisiblespacebox}%
480 \fi
481 }
```

(End definition for \@setupverbvisiblespace.)

**\@verbvisiblespacebox** The box to hold the visible space character if it isn't in slot 32 in the current typewriter font.

```
482 \newbox\@verbvisiblespacebox
```

(End definition for \@verbvisiblespacebox.)

`verbatim*` (*env.*) For `verbatim*` we also set up the correct visible space character definition and then run `\@vobeyspaces`. As this code is not called as part of the normal `verbatim` environment (the method is done the other way around this time) we don't have to check if space is already active—it shouldn't be.

```

483 \namedef{verbatim*}{\@verbatim
484   \@setupverbvisiblespace
485   \frenchspacing\@vobeyspaces\@sxverbatim}
486 \expandafter\let\csname endverbatim*\endcsname =\endverbatim

487 </2ekernel | latexrelease>
488 <latexrelease>\EndIncludeInRelease
489 <latexrelease>\IncludeInRelease{0000/00/00}%
490 <latexrelease>           {\verbvisiblespace}{Setup visible space for \verb}%
491 <latexrelease>
492 <latexrelease>\namedef{verbatim*}{\@verbatim\@sxverbatim}
493 <latexrelease>
494 <latexrelease>\let\asciispace           \@undefined
495 <latexrelease>\let\verbvisiblespace     \@undefined
496 <latexrelease>\let\@setupverbvisiblespace \@undefined
497 <latexrelease>\let\@verbvisiblespacebox \@undefined
498 <latexrelease>\EndIncludeInRelease
499 <*2ekernel>

```

`\@sverb` Definitions of `\@sverb` and `\@verb` changed so `\verb+ foo+` does not lose leading blanks  
`\@@sverb` when it comes at the beginning of a line. Change made 24 May 89. Suggested by Frank Mittelbach and Rainer Schöpf.

```

500 </2ekernel>
501 <*2ekernel | latexrelease>
502 <latexrelease>\IncludeInRelease{2020/10/01}%
503 <latexrelease>           {\@sverb}{Drop spaces before \verb delimiter}%

```

If the users types `\verb !~! foo` then surprisingly we would get the space as the delimiter and thus “!~!foo” in the output. To avoid this scenario we check if #1 has the character code of a space, if so we recurse otherwise we call `\@@sverb` (which is the original definition of `\@sverb`).

```

504 \def\@sverb#1{\if\noexpand#1 \expandafter\@sverb\else\@@sverb{#1}\fi}

505 \def\@@sverb#1{%
506   \catcode'\#1\active
507   \lccode'\~'\#1%
508   \gdef\verb@balance@group{\verb@egroup
509     \@latex@error{noexpand\verb illegal in argument}\@ehc}%
510   \aftergroup\verb@balance@group
511   \lowercase{\let~\verb@egroup}%

```

If `\@sverb` is called from `\@verb` then space is already active and supposed to produce a real space. In this case we do nothing. Otherwise we run `\@setupverbvisiblespace` to setup the right visible space char and afterwards `\@vobeyspaces` to make it the definition for the active space character.

```

512   \ifnum\catcode'\ =\active
513   \else \@setupverbvisiblespace \@vobeyspaces \fi
514 }

```

```

515 </2ekernel | latexrelease>
516 <latexrelease>\EndIncludeInRelease
517 <latexrelease>\IncludeInRelease{2018/12/01}%
518 <latexrelease>          {\@sverb}{Setup visible space for \verb}%
519 <latexrelease>
520 <latexrelease>\def\@sverb#1{%
521 <latexrelease>  \catcode'#1\active
522 <latexrelease>  \lccode'\~'#1%
523 <latexrelease>  \gdef\verb@balance@group{\verb@egroup
524 <latexrelease>    \@latex@error{\noexpand\verb illegal in command argument}\@ehc}%
525 <latexrelease>  \aftergroup\verb@balance@group
526 <latexrelease>  \lowercase{\let~\verb@egroup}%
527 <latexrelease>  \ifnum\catcode'\ =\active
528 <latexrelease>  \else  \@setupverbvisiblespace \@vobeyspaces \fi
529 <latexrelease>}
530 <latexrelease>\let\@@sverb\@undefined
531 <latexrelease>\EndIncludeInRelease
532 <latexrelease>
533 <latexrelease>\IncludeInRelease{0000/00/00}%
534 <latexrelease>          {\@sverb}{Setup visible space for \verb}%
535 <latexrelease>\def\@sverb#1{%
536 <latexrelease>  \catcode'#1\active
537 <latexrelease>  \lccode'\~'#1%
538 <latexrelease>  \gdef\verb@balance@group{\verb@egroup
539 <latexrelease>    \@latex@error{\noexpand\verb illegal in command argument}\@ehc}%
540 <latexrelease>  \aftergroup\verb@balance@group
541 <latexrelease>  \lowercase{\let~\verb@egroup}}%
542 <latexrelease>
543 <latexrelease>\EndIncludeInRelease
544 <*2ekernel>

```

*(End definition for \@sverb and \@@sverb.)*

**\@makeother**

```

545 \def\@makeother#1{\catcode'#112\relax}

```

*(End definition for \@makeother.)*

**\verb@balance@group**

```

546 \let\verb@balance@group\@empty

```

*(End definition for \verb@balance@group.)*

**\verb@egroup**

```

547 \def\verb@egroup{\global\let\verb@balance@group\@empty\egroup}

```

*(End definition for \verb@egroup.)*

**\verb@eol@error**

```

548 \begingroup
549   \obeylines%
550   \gdef\verb@eol@error{\obeylines%
551     \def~M{\verb@egroup\@latex@error{%
552       \noexpand\verb ended by end of line}\@ehc}}%
553 \endgroup

```

(End definition for \verb@eol@error.)

\verb Typesetting a small piece verbatim.

```
554 </2ekernel>
555 <*2ekernel | latexrelease>
556 <latexrelease>\IncludeInRelease{2017-04-15}{\verb}%
557 <latexrelease> {Disable hyphenation in verb}%
558 \def\verb{\relax\ifmmode\hbox\else\leavevmode\null\fi
559 \bgroup
560 \verb@eol@error \let\do\@makeoother \dospecials
561 \verbatim@font\@noligs
```

Set \language here to suppress hyphenation. Done this way rather than setting \hyphenchar as that is a global setting.

```
562 \language\l@nohyphenation
563 \@ifstar\@sverb\@verb}
564 </2ekernel | latexrelease>
565 <latexrelease>\EndIncludeInRelease
566 <latexrelease>\IncludeInRelease{0000-00-00}{\verb}%
567 <latexrelease> {Disable hyphenation in verb}%
568 <latexrelease>\def\verb{\relax\ifmmode\hbox\else\leavevmode\null\fi
569 <latexrelease> \bgroup
570 <latexrelease> \verb@eol@error \let\do\@makeoother \dospecials
571 <latexrelease> \verbatim@font\@noligs
572 <latexrelease> \@ifstar\@sverb\@verb}
573 <latexrelease>\EndIncludeInRelease
574 <*2ekernel>
```

(End definition for \verb.)

\@verb

```
575 \def\@verb{\@vobeyspaces \frenchspacing \@sverb}
```

(End definition for \@verb.)

\verbatim@nolig@list

```
576 \def\verbatim@nolig@list{\do\‘\do\<\do\>\do\,\do\’\do\~}
```

(End definition for \verbatim@nolig@list.)

\do@noligs

```
577 \def\do@noligs#1{%
578 \catcode‘#1\active
579 \begingroup
580 \lccode‘~‘#1\relax
581 \lowercase{\endgroup\def~{\leavevmode\kern\z@\char‘#1}}}
```

(End definition for \do@noligs.)

\@noligs To stay compatible with packages that use \@noligs we keep it.

```
582 \def\@noligs{\let\do\do@noligs \verbatim@nolig@list}
```

(End definition for \@noligs.)

```
583 </2ekernel>
```

## File I

# ltmath.dtx

## 1 Math setup

This file contains a lot of the original plain T<sub>E</sub>X code, as well as the L<sup>A</sup>T<sub>E</sub>X environments for math. It still needs sorting out.

```
1 <*2kernel>
2 \message{math definitions,}
```

### 1.1 Math commands based on plain T<sub>E</sub>X

#### 1.1.1 The log-like functions

`\log` The standard operators:

```
3 \DeclareRobustCommand\log{\mathop{\operator@font log}\nolimits}
4 \DeclareRobustCommand\lg{\mathop{\operator@font lg}\nolimits}
5 \DeclareRobustCommand\ln{\mathop{\operator@font ln}\nolimits}
6 \DeclareRobustCommand\lim{\mathop{\operator@font lim}}
7 \DeclareRobustCommand\limsup{\mathop{\operator@font lim}\nolimits,\sup}
8 \DeclareRobustCommand\liminf{\mathop{\operator@font lim}\nolimits,\inf}
9 \DeclareRobustCommand\sin{\mathop{\operator@font sin}\nolimits}
10 \DeclareRobustCommand\arcsin{\mathop{\operator@font arcsin}\nolimits}
11 \DeclareRobustCommand\sinh{\mathop{\operator@font sinh}\nolimits}
12 \DeclareRobustCommand\cos{\mathop{\operator@font cos}\nolimits}
13 \DeclareRobustCommand\arccos{\mathop{\operator@font arccos}\nolimits}
14 \DeclareRobustCommand\cosh{\mathop{\operator@font cosh}\nolimits}
15 \DeclareRobustCommand\tan{\mathop{\operator@font tan}\nolimits}
16 \DeclareRobustCommand\arctan{\mathop{\operator@font arctan}\nolimits}
17 \DeclareRobustCommand\tanh{\mathop{\operator@font tanh}\nolimits}
18 \DeclareRobustCommand\cot{\mathop{\operator@font cot}\nolimits}
19 \DeclareRobustCommand\coth{\mathop{\operator@font coth}\nolimits}
20 \DeclareRobustCommand\sec{\mathop{\operator@font sec}\nolimits}
21 \DeclareRobustCommand\csc{\mathop{\operator@font csc}\nolimits}
22 \DeclareRobustCommand\max{\mathop{\operator@font max}}
23 \DeclareRobustCommand\min{\mathop{\operator@font min}}
24 \DeclareRobustCommand\sup{\mathop{\operator@font sup}}
25 \DeclareRobustCommand\inf{\mathop{\operator@font inf}}
26 \DeclareRobustCommand\arg{\mathop{\operator@font arg}\nolimits}
27 \DeclareRobustCommand\ker{\mathop{\operator@font ker}\nolimits}
28 \DeclareRobustCommand\dim{\mathop{\operator@font dim}\nolimits}
29 \DeclareRobustCommand\hom{\mathop{\operator@font hom}\nolimits}
30 \DeclareRobustCommand\det{\mathop{\operator@font det}}
31 \DeclareRobustCommand\exp{\mathop{\operator@font exp}\nolimits}
32 \DeclareRobustCommand\Pr{\mathop{\operator@font Pr}}
33 \DeclareRobustCommand\gcd{\mathop{\operator@font gcd}}
34 \DeclareRobustCommand\deg{\mathop{\operator@font deg}\nolimits}
```

*(End definition for \log.)*

`\bmod` And some operators have to be done by hand:

```

35 \DeclareRobustCommand\bmod{%
36   \nonscript\mskip-\medmuskip\mkern5mu%
37   \mathbin{\operator@font mod}\penalty900\mkern5mu%
38   \nonscript\mskip-\medmuskip}

```

(End definition for \bmod.)

**\pmod**

```

39 \DeclareRobustCommand\pmod[1]{%
40   \allowbreak\mkern18mu({\operator@font mod}\,\,\,#1)}

```

(End definition for \pmod.)

### 1.1.2 Biggggg

**\big** Variants on \big and friends for use with delimiters:

```

41 \DeclareRobustCommand\bigl{\mathopen\big}
42 \DeclareRobustCommand\bigm{\mathrel\big}
43 \DeclareRobustCommand\bigl{\mathclose\big}
44 \DeclareRobustCommand\Bigl{\mathopen\Big}
45 \DeclareRobustCommand\Bigm{\mathrel\Big}
46 \DeclareRobustCommand\Bigl{\mathclose\Big}
47 \DeclareRobustCommand\biggl{\mathopen\bigg}
48 \DeclareRobustCommand\biggm{\mathrel\bigg}
49 \DeclareRobustCommand\biggr{\mathclose\bigg}
50 \DeclareRobustCommand\Biggl{\mathopen\Bigg}
51 \DeclareRobustCommand\Biggm{\mathrel\Bigg}
52 \DeclareRobustCommand\Biggr{\mathclose\Bigg}

```

(End definition for \big.)

### 1.1.3 The UNSORTED Rest

The other math commands are lifted from plain T<sub>E</sub>X.

**\jot**

```

53 \newdimen\jot
54 \jot=3pt

```

(End definition for \jot.)

**\interdisplaylinepenalty**

```

55 \newcount\interdisplaylinepenalty
56 \interdisplaylinepenalty=100

```

(End definition for \interdisplaylinepenalty.)

**\choose**

```

57 \def\choose{\atopwithdelims()}

```

(End definition for \choose.)

**\brack**

```

58 \def\brack{\atopwithdelims[]}

```

(End definition for \brack.)



```

\brace
59 \def\brace{\atopwithdelims\{\}}
(End definition for \brace.)

\mathpalette
60 \def\mathpalette#1#2{%
61   \mathchoice
62     {#1\displaystyle{#2}}%
63     {#1\textstyle{#2}}%
64     {#1\scriptstyle{#2}}%
65     {#1\scriptscriptstyle{#2}}
(End definition for \mathpalette.)

\root
\rootbox
\root
66 \newbox\rootbox
67 \def\root#1\of{%
68   \setbox\rootbox\hbox{$\m@th\scriptscriptstyle{#1}$}%
69   \mathpalette\root
70 \def\root#1#2{%
71   \setbox\rootbox\hbox{$\m@th#1\sqrt{\scriptscriptstyle{#2}}$}%
72   \dimen@=\ht\rootbox \advance\dimen@-\dp\rootbox
73   \mkern5mu\raise.6\dimen@\copy\rootbox
74   \mkern-10mu\box\rootbox
(End definition for \root, \rootbox, and \root.)

\phantom
\hphantom
\phantom
75 \newif\ifv@
76 \newif\ifh@
77 </2ekernel>
78 <*2ekernel | latexrelease>
79 <latexrelease>\IncludeInRelease{2019/10/01}%
80 <latexrelease>{\vphantom}{Make commands robust}%
81 \DeclareRobustCommand\vphantom{\v@true\h@false\ph@nt}
82 \DeclareRobustCommand\hphantom{\v@false\h@true\ph@nt}
83 \DeclareRobustCommand\phantom{\v@true\h@true\ph@nt}
84 \DeclareRobustCommand\mathstrut{\vphantom{}}

\mathstrut
85 </2ekernel | latexrelease>
86 <latexrelease>\EndIncludeInRelease
87 <latexrelease>\IncludeInRelease{0000/00/00}%
88 <latexrelease>{\vphantom}{Make commands robust}%
89 <latexrelease>
90 <latexrelease>\kernel@make@fragile\vphantom
91 <latexrelease>\kernel@make@fragile\hphantom
92 <latexrelease>\kernel@make@fragile\phantom
93 <latexrelease>\kernel@make@fragile\mathstrut
94 <latexrelease>
95 <latexrelease>\EndIncludeInRelease
96 <*2ekernel>

```

```

97 \def\ph@nt{%
98   \ifmode
99     \expandafter\mathpalette\expandafter\mathph@nt
100   \else
101     \expandafter\makeph@nt
102   \fi}
103 \def\makeph@nt#1{%
104   \setbox\z@\hbox{\color@begingroup#1\color@endgroup}\finph@nt}
105 \def\mathph@nt#1#2{%
106   \setbox\z@\hbox{\$ \m@th#1{#2}$}\finph@nt}
107 \</2ekernel>
108 \<2ekernel | latexrelease>
109 \<latexrelease>\IncludeInRelease{2018/12/01}%
110 \<latexrelease>          {\finph@nt}{Start LR-mode}%
111 \def\finph@nt{%
112   \setbox\tw@\null
113   \ifv@ \ht\tw@\ht\z@ \dp\tw@\dp\z@\fi
114   \ifh@ \wd\tw@\wd\z@\fi
115   \leavevmode@ifvmode\box\tw@}
116 \</2ekernel | latexrelease>
117 \<latexrelease>\EndIncludeInRelease
118 \<latexrelease>\IncludeInRelease{0000/00/00}%
119 \<latexrelease>          {\finph@nt}{Start LR-mode}%
120 \<latexrelease>\def\finph@nt{%
121 \<latexrelease>   \setbox\tw@\null
122 \<latexrelease>   \ifv@ \ht\tw@\ht\z@ \dp\tw@\dp\z@\fi
123 \<latexrelease>   \ifh@ \wd\tw@\wd\z@\fi \box\tw@}
124 \<latexrelease>\EndIncludeInRelease
125 \<2ekernel>

```

(End definition for \phantom and others.)

\smash

```

126 \DeclareRobustCommand\smash{%
127   \relax % \relax, in case this comes first in \halign
128   \ifmode
129     \expandafter\mathpalette\expandafter\mathsm@sh
130   \else
131     \expandafter\makesm@sh
132   \fi}
133 \def\makesm@sh#1{%
134   \setbox\z@\hbox{\color@begingroup#1\color@endgroup}\finsm@sh}
135 \def\mathsm@sh#1#2{%
136   \setbox\z@\hbox{\$ \m@th#1{#2}$}\finsm@sh}
137 \</2ekernel>
138 \<2ekernel | latexrelease>
139 \<latexrelease>\IncludeInRelease{2018/12/01}%
140 \<latexrelease>          {\finsm@sh}{Start LR-mode}%
141 \def\finsm@sh{\ht\z@\z@ \dp\z@\z@ \leavevmode@ifvmode\box\z@}
142 \</2ekernel | latexrelease>
143 \<latexrelease>\EndIncludeInRelease

```

```

144 <latexrelease>\IncludeInRelease{0000/00/00}%
145 <latexrelease>          {\finsm@sh}{Start LR-mode}%
146 <latexrelease>\def\finsm@sh{\ht\z@\z@ \dp\z@\z@ \box\z@}
147 <latexrelease>\EndIncludeInRelease
148 <*2ekernel>

(End definition for \smash.)

\buildrel

149 \def\buildrel#1\over#2{\mathrel{\mathop{\kern\z@#2}\limits^{#1}}}

(End definition for \buildrel.)

</2ekernel>
<*2ekernel | latexrelease>
152 <latexrelease>\IncludeInRelease{2019/10/01}%
153 <latexrelease>          {\cases}{Make commands robust}%

\cases

154 \DeclareRobustCommand*\cases[1]{\left\{\,,\vcenter{\normalbaselines\m@th
155   \ialign{##\hfil$&\quad##\hfil\crr#1\crr}}\right.}

(End definition for \cases.)

\matrix

156 \DeclareRobustCommand*\matrix[1]{\null\,,\vcenter{\normalbaselines\m@th
157   \ialign{\hfil$##$\hfil&\quad\hfil$##$\hfil\crr
158     \mathstrut\crr\noalign{\kern-\baselineskip}
159     #1\crr\mathstrut\crr\noalign{\kern-\baselineskip}}}\,,}

(End definition for \matrix.)

\pmatrix

160 \DeclareRobustCommand*\pmatrix[1]{\left(\matrix{#1}\right)}

(End definition for \pmatrix.)

</2ekernel | latexrelease>
162 <latexrelease>\EndIncludeInRelease
163 <latexrelease>\IncludeInRelease{0000/00/00}%
164 <latexrelease>          {\cases}{Make commands robust}%
165 <latexrelease>
166 <latexrelease>\kernel@make@fragile\cases
167 <latexrelease>\kernel@make@fragile\matrix
168 <latexrelease>\kernel@make@fragile\pmatrix
169 <latexrelease>
170 <latexrelease>\EndIncludeInRelease
171 <*2ekernel>

\bordermatrix

172 \def\bordermatrix#1{\begingroup \m@th
173   \@tempdima 8.75\p@
174   \setbox\z@\vbox{%
175     \def\cr{\crr\noalign{\kern2\p@\global\let\cr\endline}}%
176     \ialign{##$\hfil\kern2\p@\kern\@tempdima&\thinspace\hfil$##$\hfil
177       &\quad\hfil$##$\hfil\crr

```

```

178 \omit\strut\hfil\crr\noalign{\kern-\baselineskip}%
179 #1\crr\omit\strut\cr}}%
180 \setbox\tw@\vbox{\unvcopy\z@\global\setbox\@ne\lastbox}%
181 \setbox\tw@\hbox{\unhbox\@ne\unskip\global\setbox\@ne\lastbox}%
182 \setbox\tw@\hbox{$\kern\wd\@ne\kern-\@tempdima\left(\kern-\wd\@ne
183 \global\setbox\@ne\vbox{\box\@ne\kern2\p@}%
184 \vcenter{\kern-\ht\@ne\unvbox\z@\kern-\baselineskip}\,,\right)$}%
185 \null\;\vbox{\kern\ht\@ne\box\tw@}\endgroup}

```

(End definition for `\bordermatrix`.)

`\openup`

```

186 \protected\def\openup{\afterassignment\@openup\dimen@}
187 \def\@openup{\advance\lineskip\dimen@
188 \advance\baselineskip\dimen@
189 \advance\lineskiplimit\dimen@}

```

(End definition for `\openup`.)

`\displaylines`

```

190 \newif\ifdt@p
191 \def\displ@y{\global\dt@ptrue\openup\jot\m@th
192 \everycr{\noalign{\ifdt@p \global\dt@pfalse \ifdim\prevdepth>-1000\p@
193 \vskip-\lineskiplimit \vskip\normallineskiplimit \fi
194 \else \penalty\interdisplaylinepenalty \fi}}}
195 \def\@lign{\tabskip\z@skip\everycr{}} % restore inside \displ@y
196 \def\displaylines#1{\displ@y \tabskip\z@skip
197 \halign{\hb@xt@\displaywidth{$\@lign\hfil\displaystyle##\hfil$}\crr
198 #1\crr}}

```

(End definition for `\displaylines`.)

`\sp`

`\sb`

```

199 \let\sp=~
200 \let\sb=_

```

(End definition for `\sp` and `\sb`.)

`\tmspace` Originally L<sup>A</sup>T<sub>E</sub>X only provided a small set of spacing commands for use in text and math, some of the commands like `\;` were only supported in math mode. `amsmath` normalized and provided all of them in text and math. This code has now been moved to the kernel so that it is generally available.

`\thinspace`

`\!`

`\negthinspace`

`\:`

`\medspace`

`\negmedspace`

`\;`

`\thickspace`

`\negthickspace`

```

201 </2ekernel>
202 <*2ekernel | latexrelease>
203 <latexrelease>\IncludeInRelease{2020/10/01}%
204 <latexrelease> \tmspace\amsmath spacing commands}%

```

`\tmspace` is really meant to be an internal command so it doesn't necessarily has to be robust but it was robust in `amsmath` so we leave it like that.

```

205 \DeclareRobustCommand\tmspace[3]{%
206 \ifmmode\mskip#1#2\else\leavevmode\ifvmode\kern#1#3\fi\relax}

```

In `amsmath` the text kern is `.1667em`. For compatibility reasons we keep the longer one.

```
207 \DeclareRobustCommand\,{\tmspace+\thinmuskip{.16667em}}
208 \let\thinspace\,
209 \DeclareRobustCommand\!{\tmspace-\thinmuskip{.16667em}}
210 \let\negthinspace\!
211 \DeclareRobustCommand\:{\tmspace+\medmuskip{.2222em}}
212 \let\medspace\:
```

L<sup>A</sup>T<sub>E</sub>X has a second name for this in its manual:

```
213 \let\>=\:
214 \DeclareRobustCommand\negmedspace{\tmspace-\medmuskip{.2222em}}
215 \DeclareRobustCommand\;{\tmspace+\thickmuskip{.2777em}}
216 \let\thickspace\;
217 \DeclareRobustCommand\negthickspace{\tmspace-\thickmuskip{.2777em}}
218 </2ekernel | latexrelease>
219 <latexrelease>\EndIncludeInRelease
220 <latexrelease>\IncludeInRelease{0000/00/00}%
221 <latexrelease>          {\tmspace}{amsmath spacing commands}%
222 <latexrelease>
223 <latexrelease>\let\tmspace@undefined
224 <latexrelease>\DeclareRobustCommand{\,}{%
225 <latexrelease>    \relax\ifmmode\mskip\thinmuskip\else\thinspace\fi
226 <latexrelease>\DeclareRobustCommand\thinspace{\leavevmode@ifvmode\kern .16667em }
227 <latexrelease>\DeclareRobustCommand\negthinspace{\leavevmode@ifvmode\kern-.16667em }
228 <latexrelease>\def\>{\mskip\medmuskip}
229 <latexrelease>\let\:=\>
230 <latexrelease>\def\;{\mskip\thickmuskip}
231 <latexrelease>\def\!{\mskip-\thinmuskip}
232 <latexrelease>
233 <latexrelease>\let\negmedspace@undefined
234 <latexrelease>\let\negthickspace@undefined
235 <latexrelease>
236 <latexrelease>\EndIncludeInRelease
237 <*2ekernel>
```

*(End definition for `\tmspace` and others.)*

`\*`

```
238 \DeclareRobustCommand\*{\discretionary{\thinspace\the\textfont2\char2}{\,}{}}
```

*(End definition for `\*`.)*

`\:` Nickname for the medium space since `\>` is not available inside `tabbing`.

```
239 %\let\:=\>
```

*(End definition for `\:`.)*

`\active@math@prime` This is the definition of the active math prime.

```
240 \def\active@math@prime{^{\bgroup\prim@s}}
```

*(End definition for `\active@math@prime`.)*

`\prime@s`

```

241 {\catcode'\='=\active \global\let'\active@math@prime}
242 \def\prim@s{%
243   \prime\futurelet\@let@token\pr@m@s}
244 \def\pr@m@s{%
245   \ifx'\@let@token
246     \expandafter\pr@@@s
247   \else
248     \ifx^\@let@token
249       \expandafter\expandafter\expandafter\pr@@@t
250     \else
251       \egroup
252     \fi
253   \fi}
254 \def\pr@@@s#1{\prim@s}
255 \def\pr@@@t#1#2{#2\egroup}

(End definition for \prime@s.)

256 {\catcode'\_=\active \gdef_{\_}} % _ in math is
257                                     % either subscript or \_

```

## 1.2 Math Environments

`\(` Produces  $\dots$  with checks that `\(` isn't used in math mode, and that `\)` is only used in math mode begun with `\(`.

```

258 \</2ekernel>
259 \<latexrelease>\IncludeInRelease{2015/01/01}{\{()\}{Make \(\ robust}}%
260 \<*2ekernel | latexrelease>
261 \DeclareRobustCommand\({%
262   \relax\ifmmode\@badmath\else$\fi}%
263 \DeclareRobustCommand\){%
264   \relax\ifmmode\ifinner$\else\@badmath\fi\else \@badmath\fi}%
265 \</2ekernel | latexrelease>
266 \<latexrelease>\EndIncludeInRelease
267 \<latexrelease>\IncludeInRelease{0000/00/00}{\{()\}{Make \(\ robust}}%
268 \<latexrelease>\def\({%
269 \<latexrelease> \relax\ifmmode\@badmath\else$\fi}%
270 \<latexrelease>\expandafter\let\csname\string( \endcsname\@undefined
271 \<latexrelease>\def\){%
272 \<latexrelease> \relax\ifmmode\ifinner$\else\@badmath\fi\else \@badmath\fi}%
273 \<latexrelease>\expandafter\let\csname\string) \endcsname\@undefined
274 \<latexrelease>\EndIncludeInRelease
275 \<*2ekernel>

```

(End definition for `\(` and `\)`.)

`\[` Produces  $\dots$  with checks that `\[` isn't used in math mode, and that `\]` is only used in display math mode (though there is no real test that this display math started with `\[` and not with  $\dots$ ).

```

276 \</2ekernel>
277 \<latexrelease>\IncludeInRelease{2015/01/01}{\{[\]}{Make \[ robust}}%

```

```

278 <*2ekernel | latexrelease>
279 \DeclareRobustCommand\[%
280   \relax\ifmmode
281     \@badmath
282   \else
283     \ifvmode
284       \nointerlineskip
285       \makebox[.6\linewidth]{}%
286     \fi
287     $$$%$ BRACE MATCH HACK
288   \fi
289 }%

290 \DeclareRobustCommand\[%
291   \relax\ifmmode
292     \ifinner
293       \@badmath
294     \else
295       $$$%$ BRACE MATCH HACK
296     \fi
297   \else
298     \@badmath
299   \fi
300   \ignorespaces
301 }%

302 </2ekernel | latexrelease>
303 <latexrelease>\EndIncludeInRelease
304 <latexrelease>\IncludeInRelease{0000/00/00}{\[]{-Make \[] robust}}%
305 <latexrelease>\def\[%
306 <latexrelease>   \relax\ifmmode
307 <latexrelease>     \@badmath
308 <latexrelease>   \else
309 <latexrelease>     \ifvmode
310 <latexrelease>       \nointerlineskip
311 <latexrelease>       \makebox[.6\linewidth]{}%
312 <latexrelease>     \fi
313 <latexrelease>     $$$%$ BRACE MATCH HACK
314 <latexrelease>   \fi
315 <latexrelease>}%
316 <latexrelease>\expandafter\let\csname\string[] \endcsname\@undefined

317 <latexrelease>\def\[%
318 <latexrelease>   \relax\ifmmode
319 <latexrelease>     \ifinner
320 <latexrelease>       \@badmath
321 <latexrelease>     \else
322 <latexrelease>       $$$%$ BRACE MATCH HACK
323 <latexrelease>     \fi
324 <latexrelease>   \else
325 <latexrelease>     \@badmath
326 <latexrelease>   \fi
327 <latexrelease>   \ignorespaces
328 <latexrelease>}%
329 <latexrelease>\expandafter\let\csname\string[] \endcsname\@undefined
330 <latexrelease>\EndIncludeInRelease

```

```

331 \kernel)

(End definition for \[ and \].)

math (env.) Disguises for \(\dots\) and \[...\].
displaymath (env.) 332 \let\math=\(
333 \let\endmath=\)

334 \def\displaymath{\[}
335 \def\enddisplaymath{\]\@ignoretrue}

\@equation) Numbered equations, using the counter \c@equation. Note: The document style must
define \theequation etc., and do the appropriate \@addtoreset. It should also redefine
\@eqnnum if another format for the equation number is desired other than the standard
(...), or to move the equation numbers to the flushleft. (See comment on the \def of
\@eqnnum.)
336 \@definecounter{equation}
337 \def\equation{$$\refstepcounter{equation}}
338 \def\endequation{\eqno \hbox{\@eqnnum}$$\@ignoretrue}
(End definition for \c@equation.)

\@eqnnum Produces the equation number for equation and eqnarray environments. The following
definition is for flushright numbers; for flushleft numbers, see leqno.clo. The equation
number is set in black roman type even if an eqnarray environment appears in an italic
environment.
339 \def\@eqnnum{\normalfont \normalcolor (\theequation)}
(End definition for \@eqnnum.)

\stackrel A disguise for plain TeX's \stackrel.
340 \DeclareRobustCommand\stackrel[2]{\mathrel{\mathop{#2}\limits^{#1}}}
(End definition for \stackrel.)

\frac A disguise for plain TeX's \over.
341 \DeclareRobustCommand\frac[2]{\begingroup#1\endgroup\over#2}
(End definition for \frac.)

\sqrtn Add an optional argument to plain's \sqrt to give the nth root of an expression  $\sqrt[n]{e}$ .
\@sqrtn 342 \DeclareRobustCommand\sqrtn{\@ifnextchar[\@sqrtn\sqrtnsign}
343 \def\@sqrtn[#1]{\root #1\of}
(End definition for \sqrtn and \@sqrtn.)

\eqnarray (env.) Here's the eqnarray environment: Default is for left-hand side of equations to be
flushright. To make them flushleft, \let\@eqnarray = \hfil.
\@eqnarray 344 \newcount\@eqnarray
345 \newcount\@eqnarray
346 \newif\if@eqnarray\@eqnarraytrue
347 \newskip\@eqnarray
348 \@eqnarray = 0pt plus 1000pt

```



To get a proper `\@currentlabel` we have to redefine it for the whole display. Note that we can't use `\refstepcounter` as this results in `\@currentlabel` getting restored at the wrong and thus always writing the first label to the `.aux` file.

```

349 \def\eqnarray{%
350   \stepcounter{equation}%
351   \def\@currentlabel{\p@equation\theequation}%
352   \def\@currentcounter{equation}%
353   \global\@eqnswtrue
354   \m@th
355   \global\@eqcnt\z@
356   \tabskip\@centering
357   \let\\\@eqncr
358   $$\everycr{}\halign to\displaywidth\bgroup
359     \hskip\@centering$\displaystyle\tabskip\z@skip{##}$\@eqnrel
360     &\global\@eqcnt\@ne\hskip \tw@\arraycolsep \hfil${##}$\hfil
361     &\global\@eqcnt\tw@ \hskip \tw@\arraycolsep
362     $\displaystyle{##}$\hfil\tabskip\@centering
363     &\global\@eqcnt\thr@@ \hb@xt@\z@\bgroup\hss##\egroup
364     \tabskip\z@skip
365   \cr
366 }

367 \def\endeqnarray{%
368   \@eqncr
369   \egroup
370   \global\advance\c@equation\m@ne
371   $$\@ignoretrue
372 }

373 \let\@eqnrel=\relax
(End definition for \@eqcnt and others.)

```

**\nonumber** Switches off equation numbering.

```

374 \def\nonumber{\global\@eqnswfalse}

(End definition for \nonumber.)

```

**\@eqncr**

**\@xeqncr**

**\@yeqncr**

```

375 \protected\def\@eqncr{%
376   {\ifnum0='}\fi
377   \@ifstar{%
378     \global\@eqpen\@M\@yeqncr
379   }{%
380     \global\@eqpen\interdisplaylinepenalty \@yeqncr
381   }%
382 }

383 \def\@yeqncr{\@testopt\@eqncr\z@skip}

384 </2ekernel>
385 <*2ekernel | latexrelease>
386 <latexrelease>\IncludeInRelease{2020/10/01}%
387 <latexrelease> \{\@eqncr\}{eqnarray support calc syntax}%
388 \def\@xeqncr[#1]{%
389   \ifnum0='{ \fi}%

```

```

390 \@@eqncr
391 \noalign{\penalty\@eqpen\vskip\jot\@vspace@calcify{#1}}%
392 }
393 </2ekernel | latexrelease>
394 <latexrelease>\EndIncludeInRelease

395 <latexrelease>\IncludeInRelease{0000/00/00}%
396 <latexrelease> \@@xeqncr{eqnarray support calc syntax}%
397 <latexrelease>
398 <latexrelease>\def\@xeqncr[#1]{%
399 <latexrelease> \ifnum0='{ \fi}%
400 <latexrelease> \@@eqncr
401 <latexrelease> \noalign{\penalty\@eqpen\vskip\jot\vskip #1\relax}%
402 <latexrelease>}
403 <latexrelease>\EndIncludeInRelease
404 <*2ekernel>

```

(End definition for \@eqncr, \@xeqncr, and \@yeqncr.)

\@@eqncr

```

405 \def\@@eqncr{\let\reserved@a\relax
406 \ifcase\@eqcnt \def\reserved@a{& &}\or \def\reserved@a{& &}%
407 \or \def\reserved@a{&}\else
408 \let\reserved@a\@empty
409 \latexerror{Too many columns in eqnarray environment}\@ehc\fi
410 \reserved@a \if@eqnsw\@eqnnum\stepcounter{equation}\fi
411 \global\@eqnswtrue\global\@eqcnt\z@\cr}

```

(End definition for \@@eqncr.)

eqnarray\* (seqncr.) Here's the eqnarray\* environment:

```

412 \let\@seqncr=\@eqncr
413 \namedef{eqnarray*}{\protected\def\@eqncr{\nonumber\@seqncr}\eqnarray}
414 \namedef{endeqnarray*}{\nonumber\endeqnarray}

```

(End definition for \@seqncr.)

\lefteqn \lefteqn{FORMULA} typesets FORMULA in display math style flushleft in a box of width zero.

```

415 \def\lefteqn#1{\rlap{$\displaystyle #1$}}

```

(End definition for \lefteqn.)

\ensuremath In math mode, \ensuremath{text} is equivalent to text; in LR or paragraph mode, it is equivalent to \$text\$. \relax is not needed in front of the \ifmmode as \protect will be \let to \relax. This version (due to Donald Arseneau) avoids duplicating its argument in the 'then' and 'else' part of the \ifmath which is necessary in nested 'tabular' like environments. See amslatex/2104.

```

416 \DeclareRobustCommand{\ensuremath}{%
417 \ifmmode
418 \expandafter\@firstofone
419 \else
420 \expandafter\@ensuredmath
421 \fi}

```

(End definition for `\ensuremath`.)

`\@ensuredmath` The `\relax` stops `\ensuremath{}` starting display math.

```
422 \long\def\@ensuredmath#1{$\relax#1$}
```

(End definition for `\@ensuredmath`.)

LuaTeX contains new math primitives to place expression over or under horizontally extensible glyphs. Before LuaTeX 1.14 these did not work correctly with the `\mathstyle` primitive and sometimes did not use cramped style in consistent ways. For newer version, we opt into the corrected behavior.

```
423 \ifx\mathdefaultsmode\@undefined\else
```

```
424   \mathdefaultsmode=1
```

```
425 \fi
```

```
426 \</2ekernel>
```

## 1.3 External options to the standard document classes

### 1.3.1 Left equation numbering

`\@eqnnum` To put the equation number on the left side of an equation we have to use a little trick. The number is shifted `\displaywidth` to the left inside a box of (approximately) zero width. This fails when the equation is too wide, the equation number than may overprint the equation itself.

```
427 \*leqno
```

```
428 \renewcommand\@eqnnum{\hb@xt@.01\p@{}}%
```

```
429   \rlap{\normalfont\normalcolor
```

```
430   \hskip -\displaywidth(\theequation)}}%
```

```
431 \</leqno
```

(End definition for `\@eqnnum`.)

### 1.3.2 Flush left equations

To get the displayed math environments to print the contents flush left (with an indentation) we have to redefine all of L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>'s displayed math environments.

`\mathindent` The amount of indentation of the equations is stored in a register.

```
432 \*fleqn
```

```
433 \newskip\mathindent
```

The setting of `\mathindent` has to be deferred until the class file has been processed, because `\leftmargin` is still 0pt wide at the moment `fleqn.clo` is read in.

```
434 \AtEndOfClass{\mathindent\leftmargin}
```

(End definition for `\mathindent`.)

`\[` Begin display math;

```
435 \IncludeInRelease{2015/01/01}{\[}{Make \[ robust}%
```

```
436 \DeclareRobustCommand\[{\relax
```

```
437   \ifmmode\@badmath
```

```
438   \else
```

```
439   \begin{trivlist}%
```

```
440   \@beginparpenalty\predisplaypenalty
```

```

441             \@endparpenalty\postdisplaypenalty
442             \item[]\leavevmode
443             \hb@xt@\linewidth\bgroup $\m@th\displaystyle %$
444             \hskip\mathindent\bgroup
445         \fi}
446 \EndIncludeInRelease
447 \IncludeInRelease{0000/00/00}{\[]}{Make \[ robust}%
448 \renewcommand\[\{\relax
449     \ifmmode\@badmath
450     \else
451     \begin{trivlist}%
452     \@beginparpenalty\predisplaypenalty
453     \@endparpenalty\postdisplaypenalty
454     \item[]\leavevmode
455     \hb@xt@\linewidth\bgroup $\m@th\displaystyle %$
456     \hskip\mathindent\bgroup
457     \fi}
458 \EndIncludeInRelease

```

(End definition for \[.)

\] end display math;

```

459 \IncludeInRelease{2015/01/01}{\[]}{Make \] robust}%
460 \DeclareRobustCommand\]{\relax
461     \ifmmode
462     \egroup $\hfil% $
463     \egroup
464     \end{trivlist}%
465     \else \@badmath
466     \fi}
467 \EndIncludeInRelease
468 \IncludeInRelease{0000/00/00}{\[]}{Make \] robust}%
469 \renewcommand\]{\relax
470     \ifmmode
471     \egroup $\hfil% $
472     \egroup
473     \end{trivlist}%
474     \else \@badmath
475     \fi}
476 \EndIncludeInRelease

```

(End definition for \].)

equation (*env.*) The equation environment

```

477 \renewenvironment{equation}%
478     {\@beginparpenalty\predisplaypenalty
479     \@endparpenalty\postdisplaypenalty
480     \refstepcounter{equation}%
481     \trivlist \item[]\leavevmode
482     \hb@xt@\linewidth\bgroup $\m@th% $
483     \displaystyle
484     \hskip\mathindent}%

```

Ensure that there is at least a space between formula and equation number so that they don't bump in each other.

```

485      {\$ \hskip .3em minus.3em \hfil % $
486      \displaywidth \linewidth \hbox{\@eqnnum}%
487      \egroup
488      \endtrivlist}

```

**eqnarray** (*env.*) The eqnarray environment

```

489 \renewenvironment{eqnarray}{%
490   \stepcounter{equation}%
491   \def\@currentlabel{\p@equation\theequation}%
492   \def\@currentcounter{equation}%
493   \global\@eqnswtrue\m@th
494   \global\@eqcnt\z@
495   \tabskip\mathindent
496   \let\@=\@eqncr
497   \setlength\abovedisplayskip{\topsep}%
498   \ifvmode
499     \addtolength\abovedisplayskip{\partopsep}%
500   \fi

```

When the documentclass uses a non-zero `\parskip` setting the `\topsep` might have a negative value to compensate for that. Therefore we add `\parskip` to `\abovedisplayskip`.

```

501   \addtolength\abovedisplayskip{\parskip}%
502   \setlength\belowdisplayskip{\abovedisplayskip}%
503   \setlength\belowdisplayshortskip{\abovedisplayskip}%
504   \setlength\abovedisplayshortskip{\abovedisplayskip}%
505   $$\everycr{\halign to\linewidth% $$
506   \bgroup
507     \hskip\@centering
508     $\displaystyle\tabskip\z@skip{##}$\@eqnsele%
509     \global\@eqcnt\@ne \hskip \tw@\arraycolsep \hfil${##}$\hfil%
510     \global\@eqcnt\tw@ \hskip \tw@\arraycolsep
511     $\displaystyle{##}$\hfil \tabskip\@centering%
512     \global\@eqcnt\thr@@
513     \hb@xt@\z@\bgroup\hss##\egroup\tabskip\z@skip\cr}%
514     {\@eqncr
515   \egroup
516   \global\advance\c@equation\m@ne$$$ $
517   \@ignoretrue
518 }
519 \</fleqn>

```

## File J

# ltlists.dtx

## 1 List, and related environments

The generic commands for creating an indented environment – `enumerate`, `itemize`, `quote`, etc – are:

```
\list{<LABEL>}{<COMMANDS>} ... \endlist
```

which can be invoked by the user as the list environment. The LABEL argument specifies item labeling. COMMANDS contains commands for changing the horizontal and vertical spacing parameters.

Each item of the environment is begun by the command `\item[ITEMLABEL]` which produces an item labeled by ITEMLABEL. If the argument is missing, then the LABEL argument of the `\list` command is used as the item label.

The label is formed by putting `\makelabel{<ITEMLABEL>}` in an hbox whose width is either its natural width or else `\labelwidth`, whichever is larger. The `\list` command defines `\makelabel` to have the default definition:

```
\makelabel{<ARG>} == BEGIN \hfil ARG END
```

which, for a label of width less than `\labelwidth`, puts the label flushright, `\labelsep` to the left of the item's text. However, `\makelabel` can be `\let` to another command by the `\list`'s COMMANDS argument.

A `\usecounter{<foo>}` command in the second argument causes the counter *foo* to be initialized to zero, and stepped by every `\item` command without an argument. (`\label` commands within the list refer to this counter.)

When you leave a list environment, returning either to an enclosing list or normal text mode, LaTeX begins a new paragraph if and only if you leave a blank line after the `\end` command. This is accomplished by the `\@endparenv` command.

Blank lines are ignored every other reasonable place–i.e.:

- Between the `\begin{list}` and the first `\item`,
- Between the `\item` and the text of that item.
- Between the end of the last item and the `\end{list}`.

For an environment like quotation, in which items are not labeled, the entire environment is a single item. It is defined by letting `\quotation == \list{}{...}\item\relax`. (Note the `\relax`, there in case the first character in the environment is a '['.) The spacing parameters provide a great deal of flexibility in designing the format, including the ability to let the indentation of the first paragraph be different from that of the subsequent ones.

The trivlist environment is equivalent to a list environment whose second argument sets the following parameter values:

`\leftmargin = 0`: causes no indentation of left margin

`\labelwidth = 0`: see below for precise effect this has.

`\itemindent = 0`: with a null label, makes first paragraph have no indentation. Succeeding paragraphs have `\parindent` indentation. To give first paragraph same indentation, set `\itemindent = \parindent` before the `\item[]`.

Every `\item` in a `trivlist` environment must have an argument—in many cases, this will be the null argument (`\item[]`). The `trivlist` environment is mainly used for paragraphing environments, like `verbatim`, in which there is no margin change. It provides the same vertical spacing as the `list` environment, and works reasonably well when it occurs immediately after an `\item` command in an enclosing list.

## 1.1 List and Trivlist

The following variables are used inside a list environment:

`\totalleftmargin` The distance that the prevailing left margin is indented from the outermost left margin,

`\linewidth` The width of the current line. Must be initialized to `\hsize`.

`\listdepth` A count for holding current list nesting depth.

`\makelabel` A macro with a single argument, used to generate the label from the argument (given or implied) of the `\item` command. Initialized to `\mklab` by the `\list` command. This command must produce some stretch—i.e., an `\hfil`.

`\inlabel` A switch that is false except between the time an `\item` is encountered and the time that `TeX` actually enters horizontal mode. Should be tested by commands that can be messed up by the list environment's use of `\everypar`.

`\box\@labels` When `\inlabel = true`, it holds the labels to be put out by `\everypar`.

`\noproitem` A switch set by `\list` when `\inlabel = true`. Handles the case of a `\list` being the first thing in an item.

`\noparlist` A switch set true for a list that begins an item. No `\topsep` space is added before or after `\item`'s such a list.

`\newlist` Set true by `\list`, set false by the first text (by `\everypar`).

`\noitemarg` Set true when executing an `\item` with no explicit argument. Used to save space. To save time, make two separate `\@item` commands.

`\nmbrlist` Set true by `\usecounter` command, causes list to be numbered.

`\listctr` `\def`'ed by `\usecounter` to name of counter.

`\noskipsec` A switch set true by a sectioning command when it is creating an in-text heading with `\everypar`.

Throughout a list environment, `\hsize` is the width of the current line, measured from the outermost left margin to the outermost right margin. Environments like `tabbing` should use `\linewidth` instead of `\hsize`.

Here are the parameters of a list that can be set by commands in the `\list's` COMMANDS argument. These parameters are all `TeX` skips or dimensions (defined by `\newskip` or `\newdimen`), so the usual `TeX` or `LATeX` commands can be used to set them. The commands will be executed in `vmode` if and only if the `\list` was preceded by a `\par` (or something like an `\end{list}`), so the spacing parameters can be set according to whether the list is inside a paragraph or is its own paragraph.

## 1.2 Vertical Spacing (skips)

`\topsep`: Space between first item and preceding paragraph.

`\partopsep`: Extra space added to `\topsep` when environment starts a new paragraph (is called in `vmode`).

`\itemsep`: Space between successive items.

`\parsep`: Space between paragraphs within an item – the `\parskip` for this environment.

## 1.3 Penalties

`\@beginparpenalty`: put at the beginning of a list

`\@endparpenalty`: put at end of list

`\@itempenalty`: put between items.

## 1.4 Horizontal Spacing (dimens)

`\leftmargin`: space between left margin of enclosing environment (or of page if top level list) and left margin of this list. Must be nonnegative.

`\rightmargin`: analogous.

`\listparindent`: extra indentation at beginning of every paragraph of a list except the one started by the `\item` command. May be negative! Usually, labeled lists have `\listparindent` equal to zero.

`\itemindent`: extra indentation added right BEFORE an item label.

`\labelwidth`: nominal width of box that contains the label. If the natural width of the label  $\leq$  `\labelwidth`, then the label is flushed right inside a box of width `\labelwidth` (with an `\hfil`). Otherwise, a box of the natural width is employed, which causes an indentation of the text on that line.

`\labelsep`: space between end of label box and text of first item.

## 1.5 Default Values

Defaults for the list environment are set as follows. First, `\rightmargin`, `\listparindent` and `\itemindent` are set to 0pt. Then, one of the commands `\@listi`, `\@listii`, ... , `\@listvi` is called, depending upon the current level of the list. The `\@list ...` commands should be defined by the document style. A convention that the document style should follow is to set `\leftmargin` to `\leftmargini`, ..., `\leftmarginvi` for the appropriate level. Items that aren't changed may be left alone, but everything that could possibly be changed must be reset. *Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more)*:

```
\list{LABEL}{COMMANDS} ==  
  BEGIN  
    if \@listdepth > 5  
      then LaTeX error: 'Too deeply nested'  
      else \@listdepth :=G \@listdepth + 1
```



```

fi
\rightmargin      := 0pt
\listparindent    := 0pt
\itemindent       := 0pt
\eval{@list \romannumeral\the\@listdepth} %% Set default values:
\itemlabel        :=L LABEL
\makelabel        == \@mklab
@nmbrlist         :=L false
COMMANDS

\@trivlist          % commands common to \list and \trivlist

\parskip           :=L \parsep
\parindent         :=L \listparindent
\linewidth         :=L \linewidth - \rightmargin - \leftmargin
\totalleftmargin   :=L \@totalleftmargin + \leftmargin
\parshape 1 \@totalleftmargin \linewidth
\ignorespaces      % gobble space up to \item
END

\endlist == BEGIN \@listdepth :=G \@listdepth -1
              \endtrivlist
              END

\@trivlist ==
BEGIN
  if @newlist = T then \@noitemerr fi
                      %% This command removed for some forgotten reason.
  \@topsepadd :=L \topsep
  if @noskipsec then leave vertical mode fi %% Added 11 Jun 85
  if vertical mode
  then \@topsepadd :=L \@topsepadd + \partopsep
  else \unskip \par % remove glue from end of last line
  fi
  if @inlabel = true
  then @noparitem :=L true
       @noparlist :=L true
  else @noparlist :=L false
       \@topsep   :=L \@topsepadd
  fi
  \@topsep        :=L \@topsep + \parskip %% Change 4 Sep 85
  \leftskip       :=L 0pt % Restore paragraphing parameters
  \rightskip      :=L \@rightskip
  \parfillskip    :=L 0pt + 1fil

NOTE: \@setpar called on every \list in case \par has been
temporarily munged before the \list command.
\@setpar{if @newlist = false then {\@@par} fi}
\@newlist      :=G T
\@outerparskip :=L \parskip

```

```

END

\trivlist ==
BEGIN
  \parsep      := \parskip
  @nmbrlist := F
  \@trivlist
  \labelwidth := 0
  \leftmargin := 0
  \itemindent := \parindent
  \@itemlabel :=L "empty"      %% added 93/12/13
  \makelabel{LABEL} == LABEL
END

\endtrivlist ==
BEGIN
  if @inlabel = T then \indent fi
  if horizontal mode then \unskip \par fi
  if @noparlist = true
    else if \lastskip > 0
      then \@tempkipa := \lastskip
           \vskip - \lastskip
           \vskip \@tempkipa -\@outerparskip + \parskip
        fi
      \@endparenv
    fi
  END

\@endparenv ==
BEGIN
  \addpenalty{@endparpenalty}
  \addvspace{@topsepadd}
  \endgroup    %% ends the \begin command's \begingroup
  \par == BEGIN
    \@restorepar
    \everypar{}
    \par
  END
  \everypar == BEGIN remove \lastbox \everypar{} END
  \begingroup %% to match the \end commands \endgroup
END

\item == BEGIN if math mode then WARNING fi
          if next char = [
            then \@item
            else @noitemarg := true
                 \@item[@itemlabel]
          END

\@item[LAB] ==

```

```

BEGIN
if @noperitem = true
then @noperitem := false
    % NOTE: then clause hardly every taken,
    % so made a macro \@donoperitem
    \box\@labels :=G \hbox{\hskip -\leftmargin
                          \box\@labels
                          \hskip \leftmargin }

if @minipage = false then
    \@tempskipa := \lastskip
    \vskip -\lastskip
    \vskip \@tempskipa + \@outerparskip - \parskip
fi
else if @inlabel = true
then \indent \par % previous item empty.
fi
if hmode then 2 \unskip's
    % To remove any space at end of prev.
    % paragraph that could cause a blank line.
    \par
fi
if @newlist = T
then if @nobreak = T % Kludge if list follows \section
then \addvspace{\@outerparskip - \parskip}
else \addpenalty{\@beginparpenalty}
    \addvspace{\@topsep}
    \addvspace{-\parskip} %% added 4 Sep 85
fi
else \addpenalty{\@itempenalty}
    \addvspace{\itemsep}
fi
@inlabel :=G true
fi

\everypar{ @minipage :=G F
@newlist :=G F
if @inlabel = true
then @inlabel :=G false
    \hskip -\parindent
    \box\@labels
    \penalty 0
    %% 3 Oct 85 - allow line break here
    \box\@labels :=G null
fi
\everypar{} }

@nobreak :=G false
if @noitemarg = true
then @noitemarg := false
if @nmbrlist
then \refstepcounter{\@listctr}

```

```

fi      fi
\@tempboxa :=L \hbox{\makelabel{LAB}}
\box\@labels :=G \@labels \hskip \itemindent
               \hskip - (\labelwidth + \labelsep)
               if \wd \@tempboxa > \labelwidth
                   then \box\@tempboxa
                   else \hbox to \labelwidth {\unhbox\@tempboxa}
               fi
               \hskip\labelsep
\ignorespaces %gobble space up to text
END

```

```

\makelabel{LABEL} == ERROR %% default to catch lonely \item

```

```

\usecounter{CTR} == BEGIN @nmbrlist :=L true
                        \@listctr == CTR
                        \setcounter{CTR}{0}
                        END

```

DEFINE \dimen's and \count  
*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

```

\topskip
\partopsep 1 (*2kernel)
\itemsep    2 \newskip\topsep
\parsep     3 \newskip\partopsep
\@topsep    4 \newskip\itemsep
\@topsepadd 5 \newskip\parsep
\outerparskip 6 \newskip\@topsep
              7 \newskip\@topsepadd
              8 \newskip\@outerparskip

```

*(End definition for \topskip and others.)*

```

\leftmargin
\rightmargin 9 \newdimen\leftmargin
\listparindent 10 \newdimen\rightmargin
\itemindent   11 \newdimen\listparindent
\labelwidth   12 \newdimen\itemindent
\labelsep     13 \newdimen\labelwidth
\@totalleftmargin 14 \newdimen\labelsep
               15 \newdimen\linewidth
               16 \newdimen\@totalleftmargin \@totalleftmargin=\z@

```

*(End definition for \leftmargin and others.)*

```

\leftmargini
\leftmarginii 17 \newdimen\leftmargini
\leftmarginiii 18 \newdimen\leftmarginii
\leftmarginiv 19 \newdimen\leftmarginiii
\leftmarginv 20 \newdimen\leftmarginiv
\leftmarginvi 21 \newdimen\leftmarginv
                22 \newdimen\leftmarginvi

                (End definition for \leftmargini and others.)

\@listdepth
\@itempenalty 23 \newcount\@listdepth \@listdepth=0
\@beginparpenalty 24 \newcount\@itempenalty
\@endparpenalty 25 \newcount\@beginparpenalty
                26 \newcount\@endparpenalty

                (End definition for \@listdepth and others.)

\@labels
                27 \newbox\@labels

                (End definition for \@labels.)

\if@inlabel
\@inlabelfalse 28 \newif\if@inlabel \@inlabelfalse
\@inlabeltrue
                (End definition for \if@inlabel, \@inlabelfalse, and \@inlabeltrue.)

\if@newlist
\@newlistfalse 29 \newif\if@newlist \@newlistfalse
\@newlisttrue
                (End definition for \if@newlist, \@newlistfalse, and \@newlisttrue.)

\if@noparitem
\@noparitemfalse 30 \newif\if@noparitem \@noparitemfalse
\@noparitemtrue
                (End definition for \if@noparitem, \@noparitemfalse, and \@noparitemtrue.)

\if@noparlist
\@noparlistfalse 31 \newif\if@noparlist \@noparlistfalse
\@noparlisttrue
                (End definition for \if@noparlist, \@noparlistfalse, and \@noparlisttrue.)

\if@noitemarg
\@noitemargfalse 32 \newif\if@noitemarg \@noitemargfalse
\@noitemargtrue
                (End definition for \if@noitemarg, \@noitemargfalse, and \@noitemargtrue.)

\if@newlist
\@newlistfalse 33 \newif\if@nmbolist \@nmbolistfalse
\@newlisttrue
                (End definition for \if@newlist, \@newlistfalse, and \@newlisttrue.)

```

`list\list)`

```

34 \def\list#1#2{%
35   \ifnum \@listdepth >5\relax
36     \toodeep
37   \else
38     \global\advance\@listdepth\@ne
39   \fi
40   \rightmargin\z@
41   \listparindent\z@
42   \itemindent\z@
43   \csname @list\romannumeral\the\@listdepth\endcsname
44   \def\@itemlabel{#1}%
45   \let\makelabel\@mklab
46   \@nmbrlistfalse
47   #2\relax
48   \@trivlist
49   \parskip\parsep
50   \parindent\listparindent
51   \advance\linewidth -\rightmargin
52   \advance\linewidth -\leftmargin
53   \advance\@totalleftmargin \leftmargin
54   \parshape \@ne \@totalleftmargin \linewidth
55   \ignorespaces}

```

*(End definition for \list.)*

`\par@deathcycles`

```

56 \newcount\par@deathcycles

```

*(End definition for \par@deathcycles.)*

`\@trivlist` Because `\par` is sometimes made a no-op it is possible for a missing `\item` to produce a loop that does not fill memory and so never gets trapped by T<sub>E</sub>X. We thus need to trap this here by setting `\par` to count the number of times a paragraph is called with no progress being made started.

```

57 \def\@trivlist{%
58   \ifnoskipsec \leavevmode \fi
59   \@topsepadd \topsep
60   \ifvmode
61     \advance\@topsepadd \partopsep
62   \else
63     \unskip \par
64   \fi
65   \if@inlabel
66     \@nparitemtrue
67     \@nparlisttrue
68   \else
69     \if@newlist \@noitemerr \fi
70     \@nparlistfalse
71     \@topsep \@topsepadd
72   \fi
73   \advance\@topsep \parskip
74   \leftskip \z@skip
75   \rightskip \@rightskip
76   \parfillskip \@flushglue

```

```

77 \par@deathcycles \z@
78 \@setpar{\if@newlist
79         \advance\par@deathcycles \@ne
80         \ifnum \par@deathcycles >\@m
81         \@noitemerr
82         {\@@par}%
83         \fi
84         \else
85         {\@@par}%
86         \fi}%
87 \global \@newlisttrue
88 \@outerparskip \parskip}

```

(End definition for \@trivlist.)

~~trivlist~~ *trivlist*

```

89 \def\trivlist{%
90 \parsep\parskip
91 \@nmbrlistfalse
92 \@trivlist
93 \labelwidth\z@
94 \leftmargin\z@
95 \itemindent\z@

```

We initialise \@itemlabel so that a trivlist with an \item not having an optional argument doesn't produce an error message.

```

96 \let\@itemlabel\@empty
97 \def\makelabel##1{##1}}

```

(End definition for \trivlist.)

\endlist

```

98 \def\endlist{%
99 \global\advance\@listdepth\m@ne
100 \endtrivlist}

```

(End definition for \endlist.)

The definition of \trivlist used to be in ltspc.dtx so that other commands could be 'let to it'. They now use \def.

\endtrivlist

```

101 \def\endtrivlist{%
102 \if@inlabel
103 \leavevmode
104 \global \@inlabelfalse
105 \fi
106 \if@newlist
107 \@noitemerr
108 \global \@newlistfalse
109 \fi
110 \ifhmode\unskip \par

```

We also check if we are in math mode and issue an error message if so (hoping that \@currentvir resolves suitably). Otherwise the usual "perhaps a missing item" error will get triggered later which is confusing.

```

111 \else

```

```

112     \@inmatherr{\end{\@currenvir}}}%
113     \fi
114     \if@nolist \else
115         \ifdim\lastskip >\z@
116             \@tempskipa\lastskip \vskip -\lastskip
117             \advance\@tempskipa\parskip \advance\@tempskipa -\@outerparskip
118             \vskip\@tempskipa
119         \fi
120     \@endparenv
121 \fi
122 }

```

(End definition for `\endtrivlist`.)

`\@endparenv` To suppress the paragraph indentation in text immediately following a paragraph-making environment, `\everypar` is changed to remove the space, and `\par` is redefined to restore `\everypar`. Instead of redefining `\par` and `\everypar`, `\@endparenv` was changed to set the `@endpe` switch, letting `\end` redefine `\par` and `\everypar`.

This allows paragraph-making environments to work right when called by other environments. (Changed 27 Oct 86)

```

123 \def\@endparenv{%
124     \addpenalty\@endparpenalty\addvspace\@topsepadd\@endpetrue}
125 \langle latexrelease \rangle \IncludeInRelease{2015/01/01}{\@doendpe}{clubpenalty fix}%
126 \def\@doendpe{\@endpetrue
127     \def\par{\@restorepar

```

If a section heading changes `\clubpenalty` to keep lines after it together then this modification is restored via the `\everypar` mechanism at the start of the next paragraph. As we destroy the contents of this token here we explicitly set `\clubpenalty` back to its default.

```

128         \clubpenalty\@clubpenalty
129     \everypar{\par\@endpefalse}\everypar

```

Use `\setbox0=\lastbox` instead of `\hskip -\parindent` so that a `\noindent` becomes a no-op when used before a line immediately following a list environment (23 Oct 86).

```

130         {\setbox\z@\lastbox}%
131     \everypar{\@endpefalse}}
132 \langle latexrelease \rangle \EndIncludeInRelease
133 \langle latexrelease \rangle \IncludeInRelease{0000/00/00}{\@doendpe}{clubpenalty fix}%
134 \langle latexrelease \rangle \def\@doendpe{\@endpetrue
135 \langle latexrelease \rangle     \def\par{\@restorepar\everypar{\par\@endpefalse}\everypar
136 \langle latexrelease \rangle         {\setbox\z@\lastbox}\everypar{\@endpefalse}}
137 \langle latexrelease \rangle \EndIncludeInRelease

```

(End definition for `\@endparenv` and `\@doendpe`.)

```

\if@endpe
\@endpefalse
\@endpetrue
138 \newif\if@endpe
139 \endpefalse

```

(End definition for `\if@endpe`, `\@endpefalse`, and `\@endpetrue`.)



```

\@mklab
140 \def\@mklab#1{\hfil #1}
(End definition for \@mklab.)

\item
141 \def\item{%
142   \@inmatherr\item
143   \@ifnextchar [\@item{\@noitemargtrue \@item[\@itemlabel]}}
(End definition for \item.)

\@donoparitem
144 \def\@donoparitem{%
145   \@noparitemfalse
146   \global\setbox\@labels\hbox{\hskip -\leftmargin
147                                   \unhbox\@labels
148                                   \hskip \leftmargin}%
149   \if@minipage\else
150     \@tempskipa\lastskip
151     \vskip -\lastskip
152     \advance\@tempskipa\@outerparskip
153     \advance\@tempskipa -\parskip
154     \vskip\@tempskipa
155   \fi}
(End definition for \@donoparitem.)

\@item
156 \def\@item[#1]{%
157   \if@noparitem
158     \@donoparitem
159   \else
160     \if@inlabel
161       \indent \par
162     \fi
163     \ifhmode
164       \unskip\unskip \par
165     \fi
166     \if@newlist
167       \if@nobreak
168         \@nbitem
169       \else
170         \addpenalty\@beginparpenalty
171         \addvspace\@topsep
172         \addvspace{-\parskip}%
173       \fi
174     \else
175       \addpenalty\@itempenalty
176       \addvspace\itemsep
177     \fi
178     \global\@inlabeltrue
179   \fi
180   \everypar{%
181     \@minipagefalse
182     \global\@newlistfalse

```

This `\if@inlabel` check is needed in case an item starts of inside a group so that `\everypar` does not become empty outside that group.

```
183     \if@inlabel
184     \global\@inlabelfalse
```

The paragraph indent is now removed by using `\setbox...` since this makes `\noindent` a no-op here, as it should be. Thus the following comment is redundant but is left here for the sake of future historians: this next command was changed from an `hskip` to a `kern` to avoid a break point after the `parindent` box: the skip could cause a line-break if a very long label occurs in `raggedright` setting. If `\noindent` was used after `\item` want to cancel the `\itemindent` skip. This case can be detected as the indentation box will be void.

```
185     {\setbox\z@\lastbox
186     \ifvoid\z@
187     \kern-\itemindent
188     \fi}%

189     \box\@labels
190     \penalty\z@
191     \fi
```

This code is intended to prevent a page break after the first line of an item that comes immediately after a section title. It may be sensible to always forbid a page break after one line of an item? As with all such settings of `\clubpenalty` it is local so will have no effect if the item starts in a group.

Only resetting `\@nobreak` when it is true is now essential since now it is sometimes set locally.

```
192     \if@nobreak
193     \@nobreakfalse
194     \clubpenalty \@M
195     \else
196     \clubpenalty \@clubpenalty
197     \everypar{}%
198     \fi}%

199     \if@noitemarg
200     \@noitemargfalse
201     \if@nmbrlist

202     \refstepcounter\@listctr
203     \fi
204     \fi
```

We use `\sbox` to support colour commands.

```
205     \sbox\@tempboxa{\makelabel{#1}}%
206     \global\setbox\@labels\hbox{%
207     \unhbox\@labels
208     \hskip \itemindent
209     \hskip -\labelwidth
210     \hskip -\labelsep
211     \ifdim \wd\@tempboxa >\labelwidth
212     \box\@tempboxa
```

```

213     \else
214       \hbox to\labelwidth {\unhbox\@tempboxa}%
215     \fi
216     \hskip \labelsep}%
217   \ignorespaces}

(End definition for \@item.)

\makelabel

218 \def\makelabel#1{%
219   \@latex@error{Lonely \string\item--perhaps a missing
220     list environment}\@ehc}

(End definition for \makelabel.)

\@nbitem

221 \def\@nbitem{%
222   \@tempskipa\@outerparskip
223   \advance\@tempskipa -\parskip
224   \addvspace\@tempskipa}

(End definition for \@nbitem.)

\usecounter

225 \def\usecounter#1{\@nmblisttrue\def\@listctr{#1}\setcounter{#1}\z@}

(End definition for \usecounter.)

```

## 1.6 Itemize and Enumerate

Enumeration is done with four counters: `enumi`, `enumii`, `enumiii` and `enumiv`, where `enumN` controls the numbering of the Nth level enumeration. The label is generated by the commands `\labelenumi` ... `\labelenumiv`, which should be defined by the document style. Note that `\p@enumN\theenumN` defines the output of a `\ref` command. A typical definition might be:

```

\def\theenumii{\alph{enumii}}
\def\p@enumii{\theenumi}
\def\labelenumii{(\theenumii)}

```

which will print the labels as ‘(a)’, ‘(b)’, ... and print a `\ref` as ‘3a’.

The item numbers are moved to the right of the label box, so they are always a distance of `\labelsep` from the item.

`\@enumdepth` holds the current enumeration nesting depth.

Itemization is controlled by four commands: `\labelitemi`, `\labelitemii`, `\labelitemiii`, and `\labelitemiv`. To cause the second-level list to be bulleted, you just define `\labelitemii` to be `•`. `\@itemspacing` and `\@itemdepth` are the analogs of `\@enumspacing` and `\@enumdepth`.

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

```

\enumerate ==
BEGIN
  if \@enumdepth > 3
    then errormessage: “Too deeply nested”.
    else \@enumdepth :=L \@enumdepth + 1

```

```

        \@enumctr :=L eval(enum@\romannumeral\the\@enumdepth)
        \list{\label{\@enumctr}}
            {\usecounter{\@enumctr}
             \makelabel{LABEL} == \hss \llap{LABEL}}
    fi
END

\endenumerate == \endlist
End of historical LATEX 2.09 comments.

\@enumdepth
226 \newcount\@enumdepth \@enumdepth = 0
(End definition for \@enumdepth.)

\c@enumi
\c@enumii 227 \@definecounter{enumi}
\c@enumii 228 \@definecounter{enumii}
\c@enumiv 229 \@definecounter{enumiii}
230 \@definecounter{enumiv}
(End definition for \c@enumi and others.)

enumerate (env.)
231 \def\enumerate{%
232   \ifnum \@enumdepth >\thr@@\toodeep\else
233     \advance\@enumdepth\@ne
234     \edef\@enumctr{enum\romannumeral\the\@enumdepth}%

235     \expandafter
236     \list
237       \csname label\@enumctr\endcsname
238       {\usecounter{\@enumctr}\def\makelabel##1{\hss\llap{##1}}}%
239   \fi}
240 \let\endenumerate =\endlist

Historical LATEX 2.09 comments (not necessarily accurate any more):
\itemize ==
BEGIN
  if \@itemdepth > 3
  then errormessage: 'Too deeply nested'.
  else \@itemdepth :=L \@itemdepth + 1
    \@itemitem == eval(labelitem\romannumeral\the\@itemdepth)
    \list{\@nameuse{\@itemitem}}
      {\makelabel{LABEL} == \hss \llap{LABEL}}
  fi
END

\enditemize == \endlist

End of historical LATEX 2.09 comments.

```

```

\@itemdepth
241 \newcount\@itemdepth \@itemdepth = 0
    (End definition for \@itemdepth.)

itemize (env.)
242 \def\itemize{%
243   \ifnum \@itemdepth >\thr@@\toodeep\else
244     \advance\@itemdepth\@ne
245     \edef\@itemitem{labelitem\romannumeral\the\@itemdepth}%

246     \expandafter
247     \list
248       \csname\@itemitem\endcsname
249       {\def\makelabel##1{\hss\llap{##1}}}%
250   \fi}

251 \let\enditemize =\endlist
252 \endkernel

```

# File K

## ltboxes.dtx

### 1 L<sup>A</sup>T<sub>E</sub>X Box commands

**\makebox** `\makebox[⟨wid⟩][⟨pos⟩]{⟨obj⟩}`  
 Puts `⟨obj⟩` in an `\hbox` of width `⟨wid⟩`, positioned by `⟨pos⟩`.  
 The possible `⟨pos⟩` are:  
 s stretched,  
 l flushleft,  
 r flushright,  
 c (default) centred.  
 If `⟨wid⟩` is missing, then `⟨pos⟩` is also missing and `⟨obj⟩` is put in an `\hbox` of its natural width.

**\makebox(⟨x⟩,⟨y⟩)[⟨pos⟩]{⟨obj⟩}**  
 Puts `⟨obj⟩` in an `\hbox` of width `x * \unitlength` and height `y * \unitlength`.  
`⟨pos⟩` arguments are s, l, r or c (default) for stretched, flushleft, flushright or centred, and t or b for top, bottom – or combinations like tr or rb. Default for horizontal and vertical are centered. Note that in this picture mode version of `\makebox` a [b] aligns on the *bottom* of the text as documented. If you want to align on the *baseline* use `\makebox( , ) [b]{\raisebox{0pt}{\height}[0pt]{xyz}}` or `\makebox( , ) [b]{\smash{xyz}}`

**\mbox** `\mbox{⟨obj⟩}` The same as `\makebox{⟨obj⟩}`, but is more efficient as no checking for optional arguments is done.

**\newsavebox** `\newsavebox{⟨cmd⟩}` : If `⟨cmd⟩` is undefined, then defines it to be a T<sub>E</sub>X box register.

**\savebox** `\savebox{⟨cmd⟩} ...` : `⟨cmd⟩` is defined to be a T<sub>E</sub>X box register, and the ‘...’ are any `\makebox` arguments. It is like `\makebox`, except it doesn’t produce text but saves the value in `\box ⟨cmd⟩`.

**\sbox** `\sbox{⟨cmd⟩}{⟨obj⟩}` is an efficient abbreviation for `\savebox{⟨cmd⟩}{⟨obj⟩}`.

**lrbox (env.)** `\begin{lrbox}{⟨cmd⟩}⟨text⟩\end{lrbox}` is equivalent to `\sbox{⟨cmd⟩}{⟨text⟩}` except that any white space at the beginning and end of `⟨text⟩` is ignored.

**\framebox** `\framebox ...` : like `\makebox`, except it puts a ‘frame’ around the box. The frame is made of lines of thickness `\fboxrule`, separated by space `\fboxsep` from the text – except for `\framebox(X,Y) ...`, where the thickness of the lines is as for the picture environment, and there is no separation added.

**\fbox** `\fbox{⟨obj⟩}` is an abbreviation for `\framebox{⟨obj⟩}`.

**\parbox** `\parbox[⟨pos⟩][⟨height⟩][⟨inner-pos⟩]{⟨width⟩}{⟨text⟩}` : Makes a box with `\hsize` `⟨width⟩`, positioned by `⟨pos⟩` as follows: c : `\vcenter` (placed in `$...$` if not in math mode) b : `\vbox` t : `\vtop` default value is c. Sets `\hsize := ⟨width⟩` and calls `\@parboxrestore`, which does the following: Restores the original definitions of:

```

\par
\\
\–
\’
\‘
\=

```

Resets the following parameters:

<code>\parindent</code>	<code>= 0pt</code>	
<code>\parskip</code>	<code>= 0pt</code>	added 20 Jan 87
<code>\linewidth</code>	<code>= \hsize</code>	
<code>\totalleftmargin</code>	<code>= 0pt</code>	
<code>\leftskip</code>	<code>= 0pt</code>	
<code>\rightskip</code>	<code>= 0pt</code>	
<code>\@rightskip</code>	<code>= 0pt</code>	
<code>\parfillskip</code>	<code>= 0pt plus 1fil</code>	
<code>\lineskip</code>	<code>= \normallineskip</code>	
<code>\baselineskip</code>	<code>= \normalbaselineskip</code>	

Calls `\sloppy`

Note: `\@arrayparboxrestore` same as `\@parboxrestore` but it doesn't restore `\@`.

`minipage (env.)` `minipage` : Similar to `\parbox`, except it also makes this look like a page by setting `\textwidth == \columnwidth == box width`

changes footnotes by redefining:

```

\@mpfn == mpfootnote
\thempfn == \thempfootnote
\@footnotetext == \@mpfootnotetext
    resets the following list environment parameters:
\@listdepth == \@mplistdepth
where \@mplistdepth is initialized to zero,
    and executes \@minipagerestore to allow the document style to reset any other
parameters it desires. It sets \@minipage true, and resets \everypar to set it false. This
switch keeps \addvspace from putting space at the top of a minipage.
    Change added 24 May 89: \minipage sets \@minipage globally; \endminipage resets
it false.

```

<code>\rule</code>	<code>\rule[⟨raised⟩]{⟨width⟩}{⟨height⟩}</code> : Makes a $\langle width \rangle * \langle height \rangle$ rule, raised $\langle raised \rangle$ .
<code>\underline</code>	<code>\underline{⟨text⟩}</code> : Makes an underlined hbox with $\langle text \rangle$ in it.
<code>\raisebox</code>	<code>\raisebox{⟨distance⟩}[⟨height⟩][⟨depth⟩]{⟨box⟩}</code> : Raises $\langle box \rangle$ up by $\langle distance \rangle$ length (down if $\langle distance \rangle$ negative). Makes T <sub>E</sub> X think that the new box extends $\langle height \rangle$ above the line and $\langle depth \rangle$ below, for a total vertical length of $\langle height \rangle + \langle depth \rangle$ . Default values of $\langle height \rangle$ & $\langle depth \rangle$ = actual height and depth of box in new position.

```

1  ⟨*2ekernel⟩
2  \message{boxes,}

```

`\makebox` `\makebox` User level command just looks for optional [ or (.

```

3  ⟨/2ekernel⟩
4  ⟨latexrelease⟩\IncludeInRelease{2015/01/01}%
5  ⟨latexrelease⟩          {⟨makebox⟩}{Make \makebox robust}%
6  ⟨*2ekernel | latexrelease⟩
7  \DeclareRobustCommand\makebox{%
8    \leavevmode
9    \@ifnextchar(%)
10     \@makepicbox
11     {\@ifnextchar[⟨makebox⟩\mbox}}}%
12  ⟨/2ekernel | latexrelease⟩
13  ⟨latexrelease⟩\EndIncludeInRelease
14  ⟨latexrelease⟩\IncludeInRelease{0000/00/00}%
15  ⟨latexrelease⟩          {⟨makebox⟩}{Make \makebox robust}%

```

```

16 <latexrelease>\def\makebox{%
17 <latexrelease> \leavevmode
18 <latexrelease> \@ifnextchar(%)
19 <latexrelease> \@makepicbox
20 <latexrelease> {\@ifnextchar[\@makebox\mbox}}%
21 <latexrelease>\expandafter\let\cename makebox \endcsname\undefined
22 <latexrelease>\EndIncludeInRelease
23 <*2ekernel>

```

(End definition for \makebox.)

\mbox The basic horizontal box command for L<sup>A</sup>T<sub>E</sub>X.

```
24 \DeclareRobustCommand\mbox[1]{\leavevmode\hbox{#1}}
```

(End definition for \mbox.)

\@makebox Look for a possible second optional argument (defaults to c).

```

25 \def\@makebox[#1]{%
26   \ifnextchar [{\@imakebox[#1]}{\@imakebox[#1][c]}

```

(End definition for \@makebox.)

\@begin@tempboxa Helper macro for supporting \height, \width etc. Grab #1 into \@tempboxa and measure it.

```

27 \long\def\@begin@tempboxa#1#2{%
28   \begingroup
29   \setbox\@tempboxa#1{\color@begingroup#2\color@endgroup}%
30   \def\width{\wd\@tempboxa}%
31   \def\height{\ht\@tempboxa}%
32   \def\depth{\dp\@tempboxa}%
33   \let\totalheight\@ovri
34   \totalheight\height
35   \advance\totalheight\depth}

```

(End definition for \@begin@tempboxa.)

\@end@tempboxa End the group started by \@begin@tempboxa, so that the scope of \height only includes the ‘length’ argument to the user-command.

```
36 \let\@end@tempboxa\endgroup
```

(End definition for \@end@tempboxa.)

\bm@c Set up spacing.

```

\bm@l 37 \def\bm@c{\hss\unhbox\@tempboxa\hss}
\bm@r 38 \def\bm@l{\unhbox\@tempboxa\hss}\let\bm@t\bm@l
\bm@s 39 \def\bm@r{\hss\unhbox\@tempboxa}\let\bm@b\bm@r
\bm@t 40 \def\bm@s{\unhbox\@tempboxa}
\bm@b

```

(End definition for \bm@c and others.)

\@imakebox Internal form of \makebox.

```

41 \long\def\@imakebox[#1][#2]#3{%
42   \@begin@tempboxa\hbox{#3}%
43   \setlength\@tempdima{#1}%          support calc
44   \hb@xt@\@tempdima{\cename bm@#2\endcsname}%
45   \@end@tempboxa}

```



(End definition for \makebox.)

\@makepicbox Picture mode form of \makebox.

```

46 \def\@makepicbox(#1,#2){%
47   \ifnextchar[{\@makepicbox(#1,#2)}{\@makepicbox(#1,#2) []}}

```

(End definition for \@makepicbox.)

\@imakepicbox picture mode version

```

48 </2ekernel>
49 <*2ekernel | latexrelease>
50 <latexrelease>\IncludeInRelease{2020/10/01}%
51 <latexrelease>          {\@imakepicbox}{default units}%
52 \long\def\@imakepicbox(#1,#2)[#3]#4{%
53   \@defaultunitsset\@tempdimc{#2}\unitlength
54   \vbox to\@tempdimc
55     {\let\mb@b\vss \let\mb@l\hss \let\mb@r\hss
56      \let\mb@t\vss
57      \@tfor\reserved@a :=#3\do{%
58        \if s\reserved@a
59          \let\mb@l\relax \let\mb@r\relax
60        \else
61          \expandafter\let\csname mb@\reserved@a\endcsname\relax
62        \fi}%
63      \mb@t
64      \@defaultunitsset\@tempdimc{#1}\unitlength
65      \hb@xt@\@tempdimc{\mb@l #4\mb@r}%
66      \mb@b

```

This kern ensures that a b option aligns on the bottom of the text rather than the baseline. this is the documented behaviour in the L<sup>A</sup>T<sub>E</sub>X Book. The kern is removed in compatibility mode.

```

67   \kern\z@}}
68 </2ekernel | latexrelease>
69 <latexrelease>\EndIncludeInRelease
70 <latexrelease>\IncludeInRelease{0000/00/00}%
71 <latexrelease>          {\@imakepicbox}{default units}%
72 <latexrelease>\long\def\@imakepicbox(#1,#2)[#3]#4{%
73 <latexrelease> \vbox to#2\unitlength
74 <latexrelease> {\let\mb@b\vss \let\mb@l\hss \let\mb@r\hss
75 <latexrelease> \let\mb@t\vss
76 <latexrelease> \@tfor\reserved@a :=#3\do{%
77 <latexrelease> \if s\reserved@a
78 <latexrelease> \let\mb@l\relax \let\mb@r\relax
79 <latexrelease> \else
80 <latexrelease> \expandafter\let\csname mb@\reserved@a\endcsname\relax
81 <latexrelease> \fi}%
82 <latexrelease> \mb@t
83 <latexrelease> \hb@xt@ #1\unitlength{\mb@l #4\mb@r}%
84 <latexrelease> \mb@b
85 <latexrelease> \kern\z@}}
86 <latexrelease>\EndIncludeInRelease
87 <*2ekernel>

```

(End definition for \imakepicbox.)

`\set@color` This macro is initially a no-op, but the color package will redefine it to insert a `\special`.  
88 `\let\set@color\relax`

(End definition for \set@color.)

`\color@begingroup` In the past these macros were initially no-ops, and the color package redefined them to be `\begingroup`, `\endgroup`, `\begingroup\set@color`,  
`\color@endgroup` `\hbox\bgroup\color@begingroup`, `\color@endgroup\egroup`. and `\set to main document`  
`\color@setgroup` `color` respectively.

`\normalcolor` Nowadays we always set the group already in the kernel as this makes the coding simpler.  
`\color@hbox`  
`\color@vbox`  
`\color@endbox`

```

89 \</2kernel>
90 \<*2kernel | latexrelease>
91 \<latexrelease>\IncludeInRelease{2021/06/01}%
92 \<latexrelease>{\color@begingroup}{color group settings}%
93 \let\color@begingroup\begingroup
94 \def\color@endgroup{\endgraf\endgroup}
95 \def\color@setgroup{\color@begingroup} % changed further in color package
96 \let\normalcolor\relax % remains untouched; only changed in a color pa
97 \def\color@hbox{\hbox\bgroup\color@begingroup}
98 \def\color@vbox{\vbox\bgroup\color@begingroup}
99 \def\color@endbox{\color@endgroup\egroup}
100 \</2kernel | latexrelease>
101 \<latexrelease>\EndIncludeInRelease
102 \<latexrelease>\IncludeInRelease{0000/00/00}%
103 \<latexrelease>{\color@begingroup}{color group settings}%
104 \<latexrelease>
105 \<latexrelease>\let\color@begingroup\relax
106 \<latexrelease>\let\color@endgroup\relax
107 \<latexrelease>\let\color@setgroup\relax
108 \<latexrelease>\let\normalcolor\relax
109 \<latexrelease>\let\color@hbox\relax
110 \<latexrelease>\let\color@vbox\relax
111 \<latexrelease>\let\color@endbox\relax
112 \<latexrelease>
113 \<latexrelease>\EndIncludeInRelease
114 \<*2kernel>

```

(End definition for \color@begingroup and others.)

`\newsavebox` Allocate a new ‘savebox’.  
115 `\def\newsavebox#1{\@ifdefinable{#1}{\newbox#1}}`

(End definition for \newsavebox.)

`\savebox` Save #1 in a box register.  
116 \</2kernel>  
117 \<latexrelease>\IncludeInRelease{2015/01/01}%  
118 \<latexrelease>{\savebox}{Make \savebox robust}%  
119 \<\*2kernel | latexrelease>  
120 \DeclareRobustCommand\savebox[1]{%  
121 \@ifnextchar(%)

```

122     {\@savepicbox#1}{\@ifnextchar[\@savebox#1]{\sbox#1}}}%
123 \</2ekernel | latexrelease>
124 \<latexrelease>\EndIncludeInRelease
125 \<latexrelease>\IncludeInRelease{0000/00/00}%
126 \<latexrelease>           {\savebox}{Make \savebox robust}%
127 \<latexrelease>\def\savebox#1{%
128 \<latexrelease>  \@ifnextchar(%)
129 \<latexrelease>    {\@savepicbox#1}{\@ifnextchar[\@savebox#1]{\sbox#1}}}%
130 \<latexrelease>\expandafter\let\csname savebox \endcsname\undefined
131 \<latexrelease>\EndIncludeInRelease
132 \<*2ekernel>

```

(End definition for \savebox.)

**\sbox** Save #1 in a box register.

```

133 \DeclareRobustCommand\sbox[2]{\setbox#1\hbox{%
134   \color@setgroup#2\color@endgroup}}

```

(End definition for \sbox.)

**\@savebox** Look for second optional argument.

```

135 \def\@savebox#1[#2]{%
136   \@ifnextchar [\@isavebox#1[#2]]{\@isavebox#1[#2][c]}}

```

(End definition for \@savebox.)

**\@isavebox**

```

137 \long\def\@isavebox#1[#2][#3]#4{%
138   \sbox#1{\@imakebox[#2][#3]{#4}}}

```

(End definition for \@isavebox.)

**\@savepicbox** Picture mode version of \savebox.

```

139 \def\@savepicbox#1(#2,#3){%
140   \@ifnextchar[%]
141     {\@isavepicbox#1(#2,#3)}{\@isavepicbox#1(#2,#3) []}}

```

(End definition for \@savepicbox.)

**\@isavepicbox** Picture mode version of \savebox.

```

142 \long\def\@isavepicbox#1(#2,#3)[#4]#5{%
143   \sbox#1{\@imakepicbox(#2,#3)[#4]{#5}}}

```

(End definition for \@isavepicbox.)

**\lrbox** **lrbox**: the new environment form of \sbox. Use \aftergroup tricks to enable a *local* assignment to be made to the box, in a way that it still has an effect *outside* the **lrbox** environment.

```

144 \def\lrbox#1{%
145   \edef\reserved@a{%
146     \endgroup
147     \setbox#1\hbox{%
148       \begingroup\aftergroup}%
149     \def\noexpand\@currenvir{\@currenvir}%
150     \def\noexpand\@currenvline{\on@line}}%

```

```

151 \reserved@a
152 \endpefalse
153 \color@setgroup
154 \ignorespaces}

(End definition for \lrbox.)

\endlrbox End the lrbox environment.
155 \def\endlrbox{\unskip\color@endgroup}

(End definition for \endlrbox.)

\usebox unchanged
156 \DeclareRobustCommand\usebox[1]{\leavevmode\copy #1\relax}

(End definition for \usebox.)

\frame The following definition of \frame was written by Pavel Curtis (Extra space removed 14
Jan 88) RmS 92/08/24: Replaced occurrence of \@halfwidth by \@wholewidth
157 \DeclareRobustCommand\frame[1]{%
158 \leavevmode
159 \hbox{%
160 \hskip-\@wholewidth
161 \vbox{%
162 \vskip-\@wholewidth
163 \hrule \@height\@wholewidth
164 \hbox{%
165 \vrule\@width\@wholewidth
166 #1%
167 \vrule\@width\@wholewidth}%
168 \hrule \@height\@wholewidth
169 \vskip-\@wholewidth}%
170 \hskip-\@wholewidth}}

(End definition for \frame.)

\fbxrule user level parameters,
\fbxsep 171 \newdimen\fbxrule
172 \newdimen\fbxsep

(End definition for \fbxrule and \fbxsep.)

\fbx Abbreviated framed box command.
173 \DeclareRobustCommand\fbx[1]{%
174 \leavevmode
175 \setbox\@tempboxa\hbox{%
176 \color@begingroup
177 \kern\fbxsep{#1}\kern\fbxsep
178 \color@endgroup}%
179 \@frameb@x\relax}

(End definition for \fbx.)

```

`\framebox` Framed version of `\makebox`.

```

180 </2ekernel>
181 <latexrelease>\IncludeInRelease{2015/01/01}%
182 <latexrelease>          {\framebox}{Make \framebox robust}%
183 <*2ekernel | latexrelease>
184 \DeclareRobustCommand\framebox{%
185   \ifnextchar(%)
186     \framepicbox{\ifnextchar[\@framebox\fbbox}}%
187 </2ekernel | latexrelease>
188 <latexrelease>\EndIncludeInRelease
189 <latexrelease>\IncludeInRelease{0000/00/00}%
190 <latexrelease>          {\framebox}{Make \framebox robust}%
191 <latexrelease>\def\framebox{%
192 <latexrelease>  \ifnextchar(%)
193 <latexrelease>    \framepicbox{\ifnextchar[\@framebox\fbbox}}%
194 <latexrelease>\expandafter\let\csname framebox \endcsname\@undefined
195 <latexrelease>\EndIncludeInRelease
196 <*2ekernel>

```

*(End definition for \framebox.)*

`\@framebox` Deal with optional arguments.

```

197 \def\@framebox[#1]{%
198   \ifnextchar[%]
199     {\@framebox[#1]}%
200     {\@framebox[#1][c]}}

```

*(End definition for \@framebox.)*

`\@ifframebox` The handling the optional arguments. In order to set the whole box, including the frame to the specified dimension, we first determine that dimension from the natural size of the text, #3. calculated width.

```

201 \long\def\@ifframebox[#1][#2]#3{%
202   \leavevmode
203   \@begin@tempboxa\hbox{#3}%
204   \setlength\@tempdima{#1}%
205   \setbox\@tempboxa\hb@xt@\@tempdima
206     {\kern\fbboxsep\csname bm@#2\endcsname\kern\fbboxsep}%
207   \@frameb@x{\kern-\fbboxrule}%
208   \@end@tempboxa}

```

*(End definition for \@ifframebox.)*

`\@frameb@x` Common part of `\framebox` and `\fbbox`. #1 is a negative kern in the `\framebox` case so that the vertical rules do not add to the width of the box.

```

209 \def\@frameb@x#1{%
210   \@tempdima\fbboxrule
211   \advance\@tempdima\fbboxsep
212   \advance\@tempdima\dp\@tempboxa
213   \hbox{%
214     \lower\@tempdima\hbox{%
215       \vbox{%
216         \hrule\@height\fbboxrule
217         \hbox{%

```

```

218         \vrule\@width\fbboxrule
219         #1%
220         \vbox{%
221             \vskip\fbboxsep
222             \box\@tempboxa
223             \vskip\fbboxsep}%
224         #1%
225         \vrule\@width\fbboxrule}%
226     \hrule\@height\fbboxrule}%
227         }%
228     }%
229 }

```

(End definition for \@frameb@x.)

**\@framepicbox** Picture mode version.

```

230 \def\@framepicbox(#1,#2){%
231     \@ifnextchar[{\@ifframepicbox(#1,#2)}{\@ifframepicbox(#1,#2) []}]

```

(End definition for \@framepicbox.)

**\@ifframepicbox** Picture mode version.

```

232 \long\def\@ifframepicbox(#1,#2)[#3]#4{%
233     \frame{\@imakepicbox(#1,#2)[#3]{#4}}

```

(End definition for \@ifframepicbox.)

**\parbox** The main vertical-box command for L<sup>A</sup>T<sub>E</sub>X.

```

234 </2ekernel>
235 <latexrelease>\IncludeInRelease{2015/01/01}%
236 <latexrelease>           {\parbox}{Make \parbox robust}%
237 <*2ekernel | latexrelease>
238 \DeclareRobustCommand\parbox{%
239     \@ifnextchar[%]
240         \@iparbox
241         {\@iiiparbox c\relax[s]}}%
242 </2ekernel | latexrelease>
243 <latexrelease>\EndIncludeInRelease
244 <latexrelease>\IncludeInRelease{0000/00/00}%
245 <latexrelease>           {\parbox}{Make \parbox robust}%
246 <latexrelease>\def\parbox{%
247 <latexrelease>     \@ifnextchar[%]
248 <latexrelease>       \@iparbox
249 <latexrelease>         {\@iiiparbox c\relax[s]}}%
250 <latexrelease>\expandafter\let\csname parbox \endcsname\@undefined
251 <latexrelease>\EndIncludeInRelease
252 <*2ekernel>

```

(End definition for \parbox.)

**\@iparbox** Optional argument handling.

```

253 \def\@iparbox[#1]{%
254     \@ifnextchar[%]
255         {\@iiiparbox{#1}}%
256         {\@iiiparbox{#1}\relax[s]}}

```

(End definition for \@iparbox.)

\@iiparbox Optional argument handling.

```

257 \def\@iiparbox#1[#2]{%
258   \ifnextchar[%
259     {\@iiparbox{#1}{#2}}%
260     {\@iiparbox{#1}{#2}[#1]}}

```

(End definition for \@iiparbox.)

\@iiparbox The internal version of \parbox.

```

\@parboxto
261 \let\@parboxto\@empty
262 \long\def\@iiparbox#1#2[#3]#4#5{%
263   \leavevmode
264   \@pboxswfalse
265   \setlength\@tempdima{#4}%
266   \@begin@tempboxa\vbox{\hsize\@tempdima\@parboxrestore#5\@par}%
267   \ifx\relax#2\else
268     \setlength\@tempdimb{#2}%
269     \edef\@parboxto{to\the\@tempdimb}%
270   \fi
271   \if#1b\vbox
272   \else\if #1t\vtop
273   \else\ifmmode\vcenter
274   \else\@pboxswtrue $\vcenter
275   \fi\fi\fi
276   \@parboxto{\let\hss\vss\let\unhbox\unvbox
277     \csname bm#3\endcsname}%
278   \if@pboxsw \m@th$\fi
279   \@end@tempboxa}

```

(End definition for \@iiparbox and \@parboxto.)

\@arrayparboxrestore Restore various paragraph parameters.

The rationale for allowing two normally global flags to be set locally here was stated originally by Donald Arseneau and extended by Chris Rowley. It is because these flags are only set globally to true by section commands, and these should never appear within boxes or, indeed, in any group; and they are only ever set globally to false when they are definitely true.

If anyone is unhappy with this argument then both flags should be treated as in \set@nbreak; otherwise this command will be redundant.

```

280 </2ekernel>
281 <latexrelease>\IncludeInRelease{2017-04-15}%
282 <latexrelease>          {\normallineskiplimit}
283 <latexrelease>          {reset \lineskiplimit}%
284 <*2ekernel | latexrelease>
285 \def\@arrayparboxrestore{%
286   \let\if@nbreak\iffalse
287   \let\if@noskipsec\iffalse
288   \let\par\@par
289   \let\-\@dischyph

```

Redefined accents to allow changes in font encoding

```

290 \let\'\'@acci\let\'\'@accii\let\=\@acciii
291 \parindent\z@ \parskip\z@skip
292 \everypar{}%
293 \linewidth\hsize
294 \@totalleftmargin\z@
295 \leftskip\z@skip \rightskip\z@skip \@rightskip\z@skip
296 \parfillskip\@flushglue
297 \lineskip\normallineskip

298 \lineskiplimit\normallineskiplimit

299 \baselineskip\normalbaselineskip
300 \sloppy}
301 (/2ekernel | latexrelease)

302 <latexrelease>\EndIncludeInRelease
303 <latexrelease>\IncludeInRelease{0000-00-00}%
304 <latexrelease> \{\normallineskiplimit}
305 <latexrelease> \{reset \lineskiplimit}%
306 <latexrelease>\def\@arrayparboxrestore{%
307 <latexrelease> \let@if@nobreak\iffalse
308 <latexrelease> \let@if@noskipsec\iffalse
309 <latexrelease> \let\par\@@par
310 <latexrelease> \let\-\@dischyph
311 <latexrelease> \let\'\'@acci\let\'\'@accii\let\=\@acciii
312 <latexrelease> \parindent\z@ \parskip\z@skip
313 <latexrelease> \everypar{}%
314 <latexrelease> \linewidth\hsize
315 <latexrelease> \@totalleftmargin\z@
316 <latexrelease> \leftskip\z@skip \rightskip\z@skip \@rightskip\z@skip
317 <latexrelease> \parfillskip\@flushglue \lineskip\normallineskip
318 <latexrelease> \baselineskip\normalbaselineskip
319 <latexrelease> \sloppy}
320 <latexrelease>\EndIncludeInRelease
321 (*2ekernel)

```

*(End definition for \@arrayparboxrestore.)*

**\@parboxrestore** Restore various paragraph parameters, and also \.

```

322 \def\@parboxrestore{\@arrayparboxrestore\let\\\@normalcr}

```

*(End definition for \@parboxrestore.)*

**\if@minipage** Switch that is true at the start of a minipage.

```

323 \def\@minipagefalse{\global\let\if@minipage\iffalse}
324 \def\@minipagetrue {\global\let\if@minipage\iftrue}
325 \@minipagefalse

```

*(End definition for \if@minipage.)*

**\minipage** Essentially an environment form of \parbox.

```

326 \def\minipage{%
327 \ifnextchar[%]
328 \@iminipage
329 {\@iiiminipage c\relax[s]}}

```



(End definition for \minipage.)

\@iminipage Optional argument handling.

```
330 \def\@iminipage[#1]{%
331   \@ifnextchar[%
332     {\@iminipage{#1}}%
333     {\@iiiminipage{#1}\relax[s]}}
```

(End definition for \@iminipage.)

\@iiiminipage Optional argument handling.

```
334 \def\@iiiminipage#1[#2]{%
335   \@ifnextchar[%
336     {\@iiiminipage{#1}{#2}}%
337     {\@iiiminipage{#1}{#2}[#1]}}
```

(End definition for \@iiiminipage.)

\@iiiminipage Internal form of minipage.

```
338 \def\@iiiminipage#1#2[#3]#4{%
339   \leavevmode
340   \@pboxswfalse
341   \setlength\@tempdima{#4}%
342   \def\@mpargs{{#1}{#2}[#3]{#4}}%
343   \setbox\@tempboxa\vbox\bgroup
344     \color@begingroup
345     \hsize\@tempdima
346     \textwidth\hsize \columnwidth\hsize
347     \@parboxrestore
348     \def\@mpfn{\mpfootnote}\def\thempfn{\thempfootnote}\c@mpfootnote\z@
349     \let\@footnotetext\@mpfootnotetext
350     \let\@listdepth\@mplistdepth \@mplistdepth\z@
351     \@minipagerestore
352     \@setminipage}
```

(End definition for \@iiiminipage.)

\@minipagerestore Hook so that other styles can reset other commands in a minipage.

```
353 \let\@minipagerestore=\relax
```

(End definition for \@minipagerestore.)

\endminipage

```
354 \def\endminipage{%
355   \par
356   \unskip
357   \ifvoid\@mpfootins\else
358     \vskip\skip\@mpfootins
359     \normalcolor
360     \footnoterule
361     \unvbox\@mpfootins
362   \fi
363   \@minipagefalse   %% added 24 May 89
364   \color@endgroup
365   \egroup
366   \expandafter\@iiiparbox\@mpargs{\unvbox\@tempboxa}}
```

(End definition for \endminipage.)

\@mplistdepth Versions of \@listdepth and \footins local to minipage.

\@mpfootins 367 \newcount\@mplistdepth

368 \newinsert\@mpfootins

(End definition for \@mplistdepth and \@mpfootins.)

\@mpfootnotetext Minipage version of \@footnotetext.

Final \strut added 27 Mar 89, on suggestion by Don Hosek

369 \</2ekernel>

370 \<\*2ekernel | latexrelease>

371 \<latexrelease>\IncludeInRelease{2021/11/15}%

372 \<latexrelease>{\@mpfootnotetext}{footnotetext tagging}%

373 \long\def\@mpfootnotetext#1{%

374 \global\setbox\@mpfootins\vbox{%

375 \unvbox\@mpfootins

376 \reset@font\footnotesize

377 \hsize\columnwidth

378 \@parboxrestore

379 \def\@currentcounter{mpfootnote}%

380 \protected@edef\@currentlabel

381 {\csname p@mpfootnote\endcsname\@thefnmark}%

382 \color@begingroup

383 \makefntext{%

384 \rule\z@\footnotesep\ignorespaces#1\@finalstrut\strutbox}%

385 \par

386 \color@endgroup}}}

387 \</2ekernel | latexrelease>

388 \<latexrelease>\EndIncludeInRelease

389 \<latexrelease>\IncludeInRelease{2021/06/01}%

390 \<latexrelease>{\@mpfootnotetext}{footnotetext tagging}%

391 \<latexrelease>\long\def\@mpfootnotetext#1{%

392 \<latexrelease> \global\setbox\@mpfootins\vbox{%

393 \<latexrelease> \unvbox\@mpfootins

394 \<latexrelease> \reset@font\footnotesize

395 \<latexrelease> \hsize\columnwidth

396 \<latexrelease> \@parboxrestore

397 \<latexrelease> \protected@edef\@currentlabel

398 \<latexrelease> {\csname p@mpfootnote\endcsname\@thefnmark}%

399 \<latexrelease> \color@begingroup

400 \<latexrelease> \makefntext{%

401 \<latexrelease> \rule\z@\footnotesep\ignorespaces#1\@finalstrut\strutbox}%

402 \<latexrelease> \par

403 \<latexrelease> \color@endgroup}}}

404 \<latexrelease>\EndIncludeInRelease

405 \<latexrelease>\IncludeInRelease{0000/00/00}%

406 \<latexrelease>{\@mpfootnotetext}{footnotetext tagging}%

407 \<latexrelease>

408 \<latexrelease>\long\def\@mpfootnotetext#1{%

409 \<latexrelease> \global\setbox\@mpfootins\vbox{%

410 \<latexrelease> \unvbox\@mpfootins

411 \<latexrelease> \reset@font\footnotesize

```

412 <latexrelease> \hsize\columnwidth
413 <latexrelease> \@parboxrestore
414 <latexrelease> \protected@edef\@currentlabel
415 <latexrelease> {\csname p@mpfootnote\endcsname\@thefnmark}%
416 <latexrelease> \color@begingroup
417 <latexrelease> \@makefnmark{%
418 <latexrelease> \rule\z@\footnotesep\ignorespaces#1\@finalstrut\strutbox}%
419 <latexrelease> \color@endgroup}}
420 <latexrelease>
421 <latexrelease>\EndIncludeInRelease
422 <*2ekernel>

(End definition for \mpfootnotetext.)

423 \newif\if@pboxsw

\rule Draw a rule of the specified size.

424 </2ekernel>
425 <latexrelease>\IncludeInRelease{2015/01/01}%
426 <latexrelease> {\rule}{Make \rule robust}%
427 <*2ekernel | latexrelease>
428 \DeclareRobustCommand\rule{\@ifnextchar[\@rule{\@rule[\z@]}}%
429 </2ekernel | latexrelease>
430 <latexrelease>\EndIncludeInRelease
431 <latexrelease>\IncludeInRelease{0000/00/00}%
432 <latexrelease> {\rule}{Make \rule robust}%
433 <latexrelease>\def\rule{\@ifnextchar[\@rule{\@rule[\z@]}}%
434 <latexrelease>\expandafter\let\csname rule \endcsname\@undefined
435 <latexrelease>\EndIncludeInRelease
436 <*2ekernel>

(End definition for \rule.)

\@rule Internal form of \rule.

437 \def\@rule[#1]#2#3{%
438 \leavevmode
439 \hbox{%
440 \setlength\@tempdima{#1}%
441 \setlength\@tempdimb{#2}%
442 \setlength\@tempdimc{#3}%
443 \advance\@tempdimc\@tempdima
444 \vrule\@width\@tempdimb\@height\@tempdimc\@depth-\@tempdima}}

(End definition for \@rule.)

@@underline Saved primitive \underline.

445 \let@@underline\underline

(End definition for @@underline.)

\underline LATEX version works outside math.

446 \DeclareRobustCommand\underline[1]{%
447 \relax
448 \ifmmode@@underline{#1}%
449 \else $\@@underline{\hbox{#1}}\m@th$\relax\fi}

```

(End definition for `\underline`.)

`\raisebox` Raise a box, and change its vertical dimensions.

```

450 \end{kernel}
451 \latexrelease\IncludeInRelease{2015/01/01}%
452 \latexrelease\def\raisebox{\Make\raisebox robust}%
453 \end{kernel} \latexrelease
454 \DeclareRobustCommand\raisebox[1]{%
455   \leavevmode
456   \ifnextchar[\@rsbox{#1}\@irsbox{#1}[]{}
457 \end{kernel} \latexrelease
458 \latexrelease\EndIncludeInRelease
459 \latexrelease\IncludeInRelease{0000/00/00}%
460 \latexrelease\def\raisebox{\Make\raisebox robust}%
461 \latexrelease\def\raisebox#1{%
462 \latexrelease\leavevmode
463 \latexrelease\ifnextchar[\@rsbox{#1}\@irsbox{#1}[]{}
464 \latexrelease\expandafter\let\csname raisebox \endcsname\@undefined
465 \latexrelease\EndIncludeInRelease
466 \end{kernel}

```

(End definition for `\raisebox`.)

`\@rsbox` Optional argument handling.

```

467 \def\@rsbox#1[#2]{%
468   \ifnextchar[\@iirsbox{#1}[#2]\@irsbox{#1}[#2]}

```

(End definition for `\@rsbox`.)

`\@argrsbox` ...

(End definition for `\@argrsbox`.)

`\@irsbox` Internal version of `\raisebox` (less than two optional args).

```

469 \long\def\@irsbox#1[#2]#3{%
470   \@begin@tempboxa\hbox{#3}%
471   \setlength\@tempdima{#1}%
472   \ifx\#2\\\else\setlength\@tempdimb{#2}\fi
473   \setbox\@tempboxa\hbox{\raise\@tempdima\box\@tempboxa}%
474   \ifx\#2\\\else\ht\@tempboxa\@tempdimb\fi
475   \box\@tempboxa
476   \@end@tempboxa}

```

(End definition for `\@irsbox`.)

`\@iirsbox` Internal version of `\raisebox` (two optional args).

```

477 \long\def\@iirsbox#1[#2][#3]#4{%
478   \@begin@tempboxa\hbox{#4}%
479   \setlength\@tempdima{#1}%
480   \setlength\@tempdimb{#2}%
481   \setlength\dimen@{#3}%
482   \setbox\@tempboxa\hbox{\raise\@tempdima\box\@tempboxa}%
483   \ht\@tempboxa\@tempdimb
484   \dp\@tempboxa\dimen@
485   \box\@tempboxa
486   \@end@tempboxa}

```

(End definition for \@iirsbox.)

`\@finalstrut` This macro adds a special strut the *depth* of the box given as #1, and height and width 0pt. It is used for ensuring that the last line of a paragraph has the correct depth in ‘p’ columns of tables and in footnotes. In vertical mode nothing is done, as adding the strut (as done in 2.09) would start a new paragraph. It would be possible to inspect `\prevdepth` to check the depth of the just-completed paragraph, but we do not do that here. Actually we do even less now, skip the vmode test as it broke tabular ‘p’ columns.

The `\nobreak` was added (1995/10/31) to allow hyphenation of the final word of the paragraph.

```
487 \def\@finalstrut#1{%
488   \unskip\ifhmode\nobreak\fi\vrule\@width\z@\@height\z@\@depth\dp#1}
```

(End definition for \@finalstrut.)

## 1.1 Some low-level constructs

The following commands are basically inherited from plain T<sub>E</sub>X.

`\leftline` These macros place text on a full line either centred or left or right adjusted.

```
\rightline 489 \def\@@line{\hb@xt@\hsize}
\centerline 490 \DeclareRobustCommand\leftline[1]{\@@line{#1\hss}}
\@@line     491 \DeclareRobustCommand\rightline[1]{\@@line{\hss#1}}
           492 \DeclareRobustCommand\centerline[1]{\@@line{\hss#1\hss}}
```

(End definition for `\leftline` and others.)

`\rlap` These macros place text to the left or right of the current reference point without taking up space.

```
\llap 493 \DeclareRobustCommand\rlap[1]{\hb@xt@\z@{#1\hss}}
\clap 494 \DeclareRobustCommand\llap[1]{\hb@xt@\z@{\hss#1}}
```

And here is the version that centers, it was initially introduced by `mathtools`.

```
495 \DeclareRobustCommand\clap[1]{\hb@xt@\z@{\hss#1\hss}}
```

(End definition for `\rlap`, `\llap`, and `\clap`.)

```
496 \</2ekernel>
```

# File L

## lftab.dtx

### 1 Tabbing, Tabular and Array Environments

This section deals with ‘Lining It Up in Columns’. First the `tabbing` environment is defined, and then in second part, `tabular` together with its variants, `tabular*` and `array`.

Note that the `tabular` defined here is essentially the original L<sup>A</sup>T<sub>E</sub>X 2.09 version, not the extended version described in *The L<sup>A</sup>T<sub>E</sub>X Companion*. Use the `array` package to obtain the extended version.

#### 1.1 tabbing

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

`\dimen(\@firsttab + i)` = distance of tab stop `i` from left margin  
0 <= `i` <= 15 (?).

`\dimen\@firsttab` is initialized to `\@totalleftmargin`, so it starts at the prevailing left margin.

`\@maxtab` = number of highest defined tab register  
probably = `\@firsttab + 12`

`\@nxttabmar` = tab stop number of next line’s left margin

`\@curtabmar` = tab stop number of current line’s left margin

`\@curtab` = number of the current tab. At start of line,  
it equals `\@curtabmar`

`\@hightab` = largest tab number currently defined.

`\@tabpush` = depth of `\pushtab`’s

`\box\@curline` = contents of current line, excluding left margin  
skip, and excluding contents of current field

`\box\@curfield` = contents of current field

`@rjfield` = switch: T iff the last field of the line should  
be right-justified at the right margin.

`\tabbingsep` = distance left by the `\’` command between the  
current position and the field that is  
“left-shifted”.

#### UTILITY MACROS

`\@stopfield` : closes the current field

`\@addfield` : adds the current field to the current line.

`\@contfield` : continues the current field

`\@startfield` : begins the next field

`\@stopline` : closes the current line and outputs it

```

\@startline : starts the next line
\@ifatmargin : an \if that is true iff the current line.
                has width zero

\@startline ==
BEGIN
  \@curtabmar :=G \@nxttabmar
  \@curtab :=G \@curtabmar
  \box\@curline :=G null
  \@startfield
  \strut
END

\@stopline ==
BEGIN
  \unskip
  \@stopfield
  if @rjfield = T
    then @rjfield :=G F
      \@tempdima := \@totalleftmargin + \linewidth
      \hb@xt@ \@tempdima{\@itemfudge
                          \hskip \dimen\@curtabmar
                          \box\@curline
                          \hfil
                          \box\@curfield}
    else \@addfield
      \hbox {\@itemfudge
            \hskip \dimen\@curtabmar
            \box\@curline}
    fi
  END

\@startfield ==
BEGIN
  \box\@curfield :=G \hbox {
  END

\@stopfield ==
BEGIN
  }
  END

\@contfield ==
BEGIN
  \box\@curfield :=G \hbox { \unhbox\@currfield %%} brace matching
  END
\@addfield ==
BEGIN
  \box\@curline :=G \unbox\@curline * \unbox\@curfield
  END

```

```

\@ifatmargin ==
BEGIN
  if dim of box\@curline = 0pt then
  END

\tabbing ==
BEGIN
  \lineskip :=L 0pt
  \> == \@rtab
  \< == \@ltab
  \= == \@settab
  \+ == \@tabplus
  \- == \@tabminus
  \‘ == \@tabrj
  \’ == \@tablab
  \\\ == BEGIN \@stopline \@startline END
  \\[DIST] == BEGIN
    \@stopline \vskip DIST \@startline\ignorespaces END
  \\\* == BEGIN \@stopline \penalty 10000 \@startline END
  \\\*[DIST] == BEGIN \@stopline \penalty 10000 \vskip DIST
    \@startline\ignorespaces END
  \@hightab := \@nxttabmar :=G \@firsttab
  \@tabpush :=G 0
  \dimen\@firsttab := \@totalleftmargin
  @rjfield :=G F
  \trivlist \item\relax
  if @minipage = F then \vskip \parskip fi
  \box\@tabfbox = \rlap{\indent\the\everypar}
    % note: \the\everypar sets @inlabel :=G F
  \@itemfudge == BEGIN \box\@tabfbox END
  \@startline
  \ignorespaces
END

\@endtabbing ==
BEGIN
  \@stopline
  if \@tabpush > 0 then error message: "unmatched \poptabs" fi
  \endtrivlist
END

\@rtab ==
BEGIN
  \@stopfield
  \@addfield
  if \@curtab < \@hightab
    then \@curtab :=G \@curtab + 1
    else error message "Undefined Tab" fi

```



```

\@tempdima := \dimen\@curtab - \dimen\@curtabmar
              - width of box \@curline
\box\@curline :=G \hbox{\unhbox\@curline + \hskip\@tempdima}
\@startfield
END

\@settab ==
BEGIN
  \@stopfield
  \@addfield
  if \@curtab < \@maxtab
    then \@curtab :=G \@curtab+1
    else error message: "Too many tabs"      fi
  if \@curtab > \@hightab
    then \@hightab :=L \@curtab      fi
  \dimen\@curtab :=L \dimen\@curtabmar + width of \box\@curline
  \@startfield
END

\@ltab ==
BEGIN
  \@ifatmargin
  then if \@curtabmar > \@firsttab
    then \@curtab :=G \@curtab - 1
        \@curtabmar :=G \@curtabmar - 1
    else error message "Too many untab"      fi
  else error message "Left tab in middle of line"
  fi
END

\@tabplus ==
BEGIN
  if \@nxttabmar < \@hightab
    then \@nxttabmar :=G \@nxttabmar+1
    else error message "Undefined tab"
  fi
END

\@tabminus ==
BEGIN
  if \@nxttabmar > \@firsttab
    then \@nxttabmar :=G \@nxttabmar-1
    else error message "Too many untab"
  fi
END

\@tabrj ==
BEGIN \@stopfield
  \@addfield
  @rjfield :=G T

```

```

\@startfield
END

\@tablab ==
BEGIN \@stopfield
\box\@curline G:= \hbox{\box\@curline %% 'G' added 17 Jun 86
\hskip - width of \box\@curfield
\hskip -\tabbingsep
\box\@curfield
\hskip \tabbingsep }

\@startfield
END

\pushtabs ==
BEGIN
\@stopfield
\@tabpush :=G \@tabpush + 1
\beginngroup
\@contfield
END

\poptabs ==
BEGIN
\@stopfield
if \@tabpush > 0
then \endgroup
\@tabpush :=G \@tabpush - 1
else error message: "Too many \poptabs"
fi
\@contfield
END

```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

\a The accents \‘, \’ , and \= that have been redefined inside a tabbing environment can be called by typing \a‘, \a’ , and \a=. The macro \a is defined in `ltoutenc.dtx`.

*(End definition for \a.)*

The ‘2ekernel’ code ensures that a `\usepackage{autotabg}` is essentially ignored if a ‘full’ format is being used that has picture mode already in the format.

```

1 <2ekernel>\expandafter\let\csname ver@autotabg.sty\endcsname\fmtversion

\@firsttab
\@maxtab
2 <*2ekernel>
3 \newdimen\@gtempa
4 \chardef\@firsttab=\the\allocationnumber
5 \newdimen\@gtempa\newdimen\@gtempa\newdimen\@gtempa\newdimen\@gtempa
6 \newdimen\@gtempa\newdimen\@gtempa\newdimen\@gtempa\newdimen\@gtempa
7 \newdimen\@gtempa\newdimen\@gtempa\newdimen\@gtempa\newdimen\@gtempa
8 \newdimen\@gtempa
9 \chardef\@maxtab=\the\allocationnumber
10 \dimen\@firsttab=0pt

```

```

        (End definition for \@firsttab and \@maxtab.)

\@nxttabmar
\@curtabmar 11 \newcount\@nxttabmar
  \@curtab 12 \newcount\@curtabmar
  \@hightab 13 \newcount\@curtab
  \@tabpush 14 \newcount\@hightab
            15 \newcount\@tabpush

        (End definition for \@nxttabmar and others.)

\@curline
\@curfield 16 \newbox\@curline
\@tabfbox 17 \newbox\@curfield
            18 \newbox\@tabfbox

        (End definition for \@curline, \@curfield, and \@tabfbox.)

\if@rjfield
            19 \newif\if@rjfield

        (End definition for \if@rjfield.)

\@startline It is, in some sense, an error if the current margin tab setting is higher than the value of
            \@hightab (which is a local variable). That this is allowed is a fundamental design flaw
            which is not going to be corrected now.
            20 \def\@startline{%
            21     \ifnum \@nxttabmar >\@hightab
            22     \badtab
            23     \global\@nxttabmar \@hightab
            24     \fi
            25     \global\@curtabmar \@nxttabmar
            26     \global\@curtab \@curtabmar
            27     \global\setbox\@curline \hbox {%
            28     \@startfield
            29     \strut}

        (End definition for \@startline.)

\@stopline
            30 \def\@stopline{%
            31     \unskip
            32     \@stopfield
            33     \if@rjfield
            34     \global\@rjfieldfalse
            35     \@tempdima\@totalleftmargin
            36     \advance\@tempdima\linewidth
            37     \hb@xt@\@tempdima{%
            38     \@itemfudge\hskip\dimen\@curtabmar
            39     \box\@curline
            40     \hfil
            41     \box\@curfield}%
            42     \else
            43     \@addfield
            44     \hbox{\@itemfudge\hskip\dimen\@curtabmar\box\@curline}%
            45     \fi}

```

```

(End definition for \@stopline.)

\@startfield
46 \def\@startfield{%
47   \global\setbox\@curfield\hbox\bgroup\color@begingroup}

(End definition for \@startfield.)

\@stopfield
48 \def\@stopfield{%
49   \color@endgroup\egroup}

(End definition for \@stopfield.)

\@contfield
50 \def\@contfield{%
51   \global\setbox\@curfield\hbox\bgroup\color@begingroup
52   \unhbox\@curfield}

(End definition for \@contfield.)

\@addfield
53 \def\@addfield{\global\setbox\@curline\hbox{\unhbox
54   \@curline\unhbox\@curfield}}

(End definition for \@addfield.)

\@ifatmargin
55 \def\@ifatmargin{\ifdim \wd\@curline =\z@}

(End definition for \@ifatmargin.)

\@tabcr
56 \protected\def\@tabcr{\@stopline \ifstar{\penalty \@M \@tabcr}\@tabcr}

(End definition for \@tabcr.)

\@xtabcr
57 \def\@xtabcr{\@ifnextchar[\@itabcr{\@startline\ignorespaces}}

(End definition for \@xtabcr.)

\@itabcr
58 \</2ekernel>
59 \< *2ekernel | latexrelease>
60 \< latexrelease>\IncludeInRelease{2020/10/01}%
61 \< latexrelease>          {\@itabcr}{Tabbing calc syntax}%
62 \def\@itabcr[#1]{\@vspace@calcify{#1}\@startline\ignorespaces}
63 \</2ekernel | latexrelease>
64 \< latexrelease>\EndIncludeInRelease
65 \< latexrelease>\IncludeInRelease{0000/00/00}%
66 \< latexrelease>          {\@itabcr}{Tabbing calc syntax}%
67 \< latexrelease>
68 \< latexrelease>\def\@itabcr[#1]{\vskip #1\@startline\ignorespaces}
69 \< latexrelease>\EndIncludeInRelease
70 \< *2ekernel>

```

tabbing (env.) We use \relax to prevent \item from scanning too far.

```
\tabbing 71 \def\tabbing{\lineskip \z@skip\let\>\@rtab\let\<\@ltab\let\=\@settab
72 \let\+\@tabplus\let\-\@tabminus\let\'\@tabrj\let\'\@tablab
73 \let\=\@tabcr
74 \@hightab\@firsttab
75 \global\@nxttabmar\@firsttab
76 \dimen\@firsttab\@totalleftmargin
77 \global\@tabpush\z@ \global\@rjfieldfalse
78 \trivlist \item\relax
79 \if@minipage\else\vskip\parskip\fi

80 \setbox\@tabfbox\hbox{%
81 \rlap{\hskip\@totalleftmargin\indent\the\everypar}}%
82 \def\@itemfudge{\box\@tabfbox}%
83 \@startline\ignorespaces}
```

```
\endtabbing 84 \def\endtabbing{%
85 \@stopline\ifnum\@tabpush >\z@ \@badpoptabs \fi\endtrivlist}
```

Omitted \global added to \@rtab 17 Jun 86

```
\@rtab 86 \def\@rtab{\@stopfield\@addfield\ifnum \@curtab<\@hightab
87 \global\advance\@curtab \@ne \else\@badtab\fi
88 \@tempdima\dimen\@curtab
89 \advance\@tempdima -\dimen\@curtabmar
90 \advance\@tempdima -\wd\@curline
91 \global\setbox\@curline\hbox{\unhbox\@curline\hskip\@tempdima}%
92 \@startfield\ignorespaces}
```

```
\@settab 93 \def\@settab{\@stopfield\@addfield
94 \ifnum \@curtab <\@maxtab
95 \ifnum\@curtab =\@hightab
96 \advance\@hightab \@ne
97 \fi
98 \global\advance\@curtab \@ne
99 \else
100 \@latexerror{Tab overflow}\@ehd
101 \fi
102 \dimen\@curtab \dimen\@curtabmar
103 \advance\dimen\@curtab \wd\@curline
104 \@startfield
105 \ignorespaces}
```

```
\@ltab 106 \def\@ltab{\@ifatmargin\ifnum\@curtabmar >\@firsttab
107 \global\advance\@curtab \m@ne \global\advance\@curtabmar\m@ne\else
108 \@badtab\fi\else
109 \@latexerror{\string\<\space in mid line}\@ehd\fi\ignorespaces}
```

```
\@tabplus 110 \def\@tabplus{%
111 \ifnum\@nxttabmar<\@hightab
```

```

112     \global\advance\@nxttabmar\@ne
113 \else
114     \@badtab
115 \fi
116 \ignorespaces}

\@tabminus 117 \def\@tabminus{%
118     \ifnum\@nxttabmar>\@firsttab
119         \global\advance\@nxttabmar\m@ne
120     \else
121         \@badtab
122     \fi
123     \ignorespaces}

\@tabrj 124 \def\@tabrj{%
125     \@stopfield\@addfield\global\@rjfieldtrue\@startfield\ignorespaces}

\setbox\@curline made \global in \@tablab. 17 Jun 86

\@tablab 126 \def\@tablab{%
127     \@stopfield
128     \global\setbox\@curline\hbox{%
129         \box\@curline
130         \hskip-\wd\@curfield \hskip-\tabbingsep
131         \box\@curfield
132         \hskip\tabbingsep}%
133     \@startfield
134     \ignorespaces}

135 </2ekernel>
136 <*2ekernel | latexrelease>
137 <latexrelease>\IncludeInRelease{2019/10/01}%
138 <latexrelease>                {\pushtabs}{Make commands robust}%

\pushtabs 139 \DeclareRobustCommand\pushtabs{%
140     \@stopfield\@addfield\global\advance\@tabpush \@ne \begingroup
141         \@contfield}

\poptabs It is, in some sense, an error if, after the endgroup, the current tab setting is higher
142 \DeclareRobustCommand\poptabs{\@stopfield\@addfield
143     \ifnum \@tabpush >\z@
144         \endgroup
145         \global\advance\@tabpush \m@ne
146         \ifnum \@curtab >\@hightab
147             \global \@curtab \@hightab
148             \@badtab
149         \fi
150     \else
151         \@badpoptabs
152     \fi
153     \@contfield}

```

```

154 \DeclareRobustCommand\kill{\@stopfield\@startline\ignorespaces}
(End definition for \itabcr and others.)
155 </2ekernel | latexrelease>
156 <latexrelease>\EndIncludeInRelease
157 <latexrelease>\IncludeInRelease{0000/00/00}%
158 <latexrelease>                {\pushtabs}{Make commands robust}%
159 <latexrelease>
160 <latexrelease>\kernel@make@fragile\pushtabs
161 <latexrelease>\kernel@make@fragile\poptabs
162 <latexrelease>\kernel@make@fragile\kill
163 <latexrelease>
164 <latexrelease>\EndIncludeInRelease
165 <*2ekernel>

```

\tabbingsep

```

166 \newdimen\tabbingsep
(End definition for \tabbingsep.)

```

## 1.2 array and tabular environments

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

### ARRAY PARAMETERS:

`\arraycolsep`  
     : half the width separating columns in an array environment  
`\tabcolsep`  
     : half the width separating columns in a tabular environment  
`\arrayrulewidth`  
     : width of rules  
`\doublerulesep`  
     : space between adjacent rules in array or tabular  
`\arraystretch`  
     : line spacing in array and tabular environments is done by  
       placing a strut in every row of height and depth  
       `\arraystretch` times the height and depth of the strut  
       produced by an ordinary `\strut` command.

### PREAMBLE:

The PREAMBLE argument of an array or tabular environment can contain the following:

`l,r,c` : indicate where entry is to be placed.  
`|` : for vertical rule  
`@{EXP}` : inserts the text EXP in every column.  
       `\arraycolsep` or `\tabcolsep` spacing is suppressed.  
`*{N}{PRE}` : equivalent to writing N copies of PRE in the preamble.  
       PRE may contain `*{N'}{EXP'}` expressions.  
`p{LEN}` : makes entry in parbox of width LEN.

### SPECIAL ARRAY COMMANDS:

`\multicolumn{N}{FORMAT}{ITEM}` : replaces the next N column items by ITEM, formatted according to FORMAT. FORMAT should contain at most one l,r or c. If it contains none, then ITEM is ignored.

`\vline` : draws a vertical line the height of the current row. May appear in an array element entry.

`\hline` : draws a horizontal line between rows. Must appear either before the first entry (to appear above the first row) or right after a `\\` command. If followed by another `\hline`, then adds a `\vskip` of `\doublerulesep`.

`\cline{i-j}` : draws horizontal lines between rows covering columns i through j, inclusive. Multiple commands may follow one another to provide lines covering several disjoint columns

`\extracolsep{WIDTH}` : for use inside an @ in the preamble. Causes a WIDTH space to be added between columns for the rest of the columns. This is in addition to the ordinary intercolumn space.

```

\array ==
  BEGIN
    \@acol    == \@arrayacol
    \@classz  == \@arrayclassz
    \@classiv == \@arrayclassiv
    \\        == \@arraycr
    \@halignto == NULL
    \@tabarray
  END

\endarray{NAME} == BEGIN \crrc }} END

\tabular ==
  BEGIN
    \@halignto == NULL
    \@tabular
  END

\tabular*{WIDTH} ==
  BEGIN
    \@halignto == to WIDTH
    \@tabular
  END

\@tabular ==
  BEGIN
    \leavevmode
    \hbox { $
      \@acol    == \@tabacol

```



```

\@classz == \@tabclassz
\@classiv == \@tabclassiv
\\ == \@tabularcr
\@tabarray
END

\endtabular == BEGIN \crrc}} $} END

\@tabarray == if next char = [ then \@array else \@array[c] fi

\@array[POS]{PREAMBLE} ==
BEGIN
  define \@arstrutbox to make \@arstrut produce strut of height
    and depth \arraystretch times the height and
    depth of a normal strut.
  \@mkpream{PREAMBLE}
  \@preamble == \halign \@halignto {\tabskip=0pt\@arstrut
    eval{\@preamble}\tabskip = 0pt\cr %%}
  \@startpbox == \@@startpbox
  \@endpbox == \@@endpbox
  if POS = t then \vtop
    else if POS = b then \vbox
      else \vcenter

    fi
  fi
  {
    \par ==L {} % changed 92/09/18
    \@sharp == #
    \protect == \relax
    \lineskip :=L 0pt
    \baselineskip :=L 0pt
    \@preamble
  }
END

\@arraycr ==
BEGIN
  $ %% Prevents extra space at end of row's last entry.
  if next char = [
    then \@argarraycr
    else $ \cr %% Needed to balance $
  }
END

\@argarraycr[LENGTH] ==
BEGIN
  $ %% Needed to balance $ of \@arraycr
  if LENGTH > 0
    then \@tempdima := depth of \@arstrutbox + LENGTH
      \vrule height 0pt width 0pt depth \@tempdima
      \cr
    else \cr \noalign{\vskip LENGTH}
  }

```

END

`\@tabularcr` and `\@argtabularcr` same as `\@arraycr` and `\@argarraycr`  
except without the extra `$`'s.

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

`\extracolsep` This command needs to expand during the tabular preamble construction so can't be robust.

```
167 \def\extracolsep#1{\tabskip #1\relax}
```

*(End definition for \extracolsep.)*

`\array`~~`\array`~~

```
168 \def\array{\let\@acol\@arrayacol \let\@classz\@arrayclassz
```

```
169 \let\@classiv\@arrayclassiv
```

```
170 \let\\\@arraycr\let\@halignto\@empty\@tabarray}
```

*(End definition for \array.)*

`\endarray`

```
\endtabular 171 \def\endarray{\crcr\egroup\egroup}
```

```
\endtabular* 172 \def\endtabular{\crcr\egroup\egroup $\egroup}
```

```
173 \expandafter \let \csname endtabular*\endcsname = \endtabular
```

*(End definition for \endarray, \endtabular, and \endtabular\*.)*

`\tabular`~~`\tabular`~~

```
174 \def\tabular{\let\@halignto\@empty\@tabular}
```

*(End definition for \tabular.)*

`\tabular*` Note that the change to use `\setlength` slightly alters the timing of the expansion and use of the length in `#1` but this is very unlikely to have any practical effect.

```
175 \@namedef\tabular*#1{%
```

```
176 \setlength\dimen@{#1}%
```

```
177 \edef\@halignto{to\the\dimen@}\@tabular}
```

*(End definition for \tabular\*.)*

`\@tabular`

```
178 \def\@tabular{\leavevmode \hbox \bgroup $\let\@acol\@tabacol
```

```
179 \let\@classz\@tabclassz
```

```
180 \let\@classiv\@tabclassiv \let\\\@tabularcr\@tabarray}
```

*(End definition for \@tabular.)*

`\@tabarray` RmS 91/11/04 added `\m@th`.

```
181 \def\@tabarray{\m@th\@ifnextchar[\@array{\@array[c]}}
```

*(End definition for \@tabarray.)*

RmS 1993/11/03 changed `\halign` to `\ialign` and removed superfluous `\tabskip` assignment

`\@array`

```
182 \def\@array[#1]#2{%
```

```
183 \if #1t\vtop \else \if#1b\vbox \else \vcenter \fi\fi
```

184    **\bgroup**

This next bit of code sets up the strut and then builds the halign and its preamble according to the specification in the second argument.

This code has been moved inside the box. A side effect of this has been to expose what was a buglet in the previous version: since the **\@arstrut** below is expanded and contains an **\ifmmode** then it could produce an unnecessary extra box in every row, thus wasting ‘lots of’ main memory.

```
185    \setbox\@arstrutbox\hbox{%
186       \vrule \@height\arraystretch\ht\strutbox
187       \@depth\arraystretch \dp\strutbox
188       \@width\z@}%
189    \@mkpream{#2}%
190    \edef\@preamble{%
191       \ialign \noexpand\@halignto
192       \bgroup \@arstrut \@preamble \tabskip\z@skip \cr}%
```

That is the end of setting up the preamble; now we reset things before executing the halign built-up in **\@preamble**. The restorations could be done by introducing an extra group, thus saving tokens.

```
193    \let\@startpbox\@startpbox \let\@endpbox\@endpbox
194    \let\@tabularnewline\%
195    \let\par\@empty
196    \let\@sharp##%
197    \set@typeset@protect
198    \lineskip\z@skip\baselineskip\z@skip
```

If the parsing of the preamble goes wrong there may be some characters left which T<sub>E</sub>X then tries to typeset, i.e., we would be in horizontal mode. That would produce an endless loop because the **\halign** expects vertical mode thus issues a **\par** but that is a no-op at this point. So we better test this case issue some error message and make a crude recovery by ending that horizontal mode with force. A better fix would be to ensure that we never pick up more than a single character token (not done).

```
199    \ifhmode \@preamerr\z@ \@@par\fi
200    \@preamble}
```

*(End definition for \array.)*

**\@arraycr**    Array version of **\@array**.

```
201    \protected\def\@arraycr{%
202        ${\ifnum0=‘}\fi\@ifstar\@xarraycr\@xarraycr}
```

*(End definition for \@arraycr.)*

**\@arraycr**

```
203    \def\@xarraycr{\@ifnextchar[\@argarraycr{\ifnum0=‘{\fi}$\}\cr}}
```

*(End definition for \@arraycr.)*

**\@argarraycr**

```
204    \def\@argarraycr[#1]{%
205       \ifnum0=‘{\fi}$\}\ifdim #1>\z@ \@xargarraycr{#1}\else
206       \@yargarraycr{#1}\fi}
```

*(End definition for \@argarraycr.)*

```

\tabularnewline Tabular version of \\.
207 \let\tabularnewline\relax

(End definition for \tabularnewline.)

\@tabularcr
208 \protected\def\@tabularcr{%
209   {\ifnum0='}\fi\@ifstar\@xtabularcr\@xtabularcr}

(End definition for \@tabularcr.)

\@xtabularcr
210 \def\@xtabularcr{\@ifnextchar[\@argtabularcr{\ifnum0='{ \fi}\cr}}

(End definition for \@xtabularcr.)

\@argtabularcr
211 \def\@argtabularcr[#1]{%
212   \ifnum0='{ \fi}%
213   \ifdim #1>\z@
214     \unskip\@xargarraycr{#1}%
215   \else
216     \@yargarraycr{#1}%
217   \fi}

(End definition for \@argtabularcr.)

\@xargarraycr
218 \def\@xargarraycr#1{\@tempdima #1\advance\@tempdima \dp \@arstrutbox
219   \vrule \@height\z@ \@depth\@tempdima \@width\z@ \cr}

(End definition for \@xargarraycr.)

\@yargarraycr
220 \</2ekernel>
221 \<*2ekernel | latexrelease>
222 \<latexrelease>\IncludeInRelease{2020/10/01}%
223 \<latexrelease>{\@yargarraycr}{tabular support calc syntax}%
224 \def\@yargarraycr#1{\cr\noalign{\@vspace@calcify{#1}}}%
225 \</2ekernel | latexrelease>
226 \<latexrelease>\EndIncludeInRelease
227 \<latexrelease>\IncludeInRelease{0000/00/00}%
228 \<latexrelease>{\@yargarraycr}{tabular support calc syntax}%
229 \<latexrelease>
230 \<latexrelease>\def\@yargarraycr#1{\cr\noalign{\vskip #1}}
231 \<latexrelease>\EndIncludeInRelease
232 \<*2ekernel>

(End definition for \@yargarraycr.)

```

`\multicolumn` *Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

```

\multicolumn{NUMBER}{FORMAT}{ITEM} ==
BEGIN
\multispan{NUMBER}
\beginngroup
\@addamp == null
\@mkpream{FORMAT}
\@sharp == ITEM
\protect == \relax
\@startpbox == \@startpbox
\@endpbox == \@endpbox
\@arstrut
\@preamble
\endgroup
END

```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

The command `\def\@addamp{}` was removed from `\multicolumn` on 6 Dec 86 because it caused embedded array environments not to work. I think that it was included originally to prevent an error message if the 2nd argument to the `\multicolumn` command had two column specifiers.

8 Feb 89 — `\hbox{}` added after `\@preamble` to correct bug that occurred if `\multicolumn` preceded `\\[D]` with  $D > 0$ , caused by `\\[]` command doing an `\unskip`, which removed `\tabcolsep` glue inserted by `\multicolumn`.

This has been made long so that, for example, a p-column can contain multiple paragraphs; maybe the arguments of @-expressions should also be able to contain multiple paragraphs.

```

233 \long\def\multicolumn#1#2#3{\multispan{#1}\beginngroup
234   \@mkpream{#2}%
235   \def\@sharp{#3}\set@typeset@protect
236   \let\@startpbox\@startpbox\let\@endpbox\@endpbox
237   \@arstrut \@preamble\hbox{\endgroup\ignorespaces}

```

*(End definition for \multicolumn.)*

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

Codes for classes and character numbers of array, tabular and multicolumn arguments.

Character	Class	Number
c	0	0
l	0	1
r	0	2
	1	-
@	2	-
p	3	-
{@-exp}	4	-
{p-arg}	5	-

`\@testpach \foo` : expands `\foo`, which should be an array parameter

token, and sets \@chclass and \@chnum to its class and number. Uses \@lastchclass to distinguish 4 and 5

Preamble error codes

0: 'illegal character'  
 1: 'Missing @-exp'  
 2: 'Missing p-arg'

```
\@addamp ==
  BEGIN if \@firstamp = true then \@firstamp := false
        else &                                fi
  END
```

```
\@mkpream TOKENLIST ==
  BEGIN
    \@firstamp      := T
    \@lastchclass   := 6
    \@preamble      == null
    \@sharp         == \relax
    \@protect       == BEGIN \noexpand\protect\noexpand END
    \@startpbox     == \relax
    \@endpbox       == \relax
    \@expast{TOKENLIST}
    for \@nextchar := expand(\reserved@a)
      do \@testpach{\@nextchar}
        case of \@chclass
          0 -> \@classz
          1 -> \@classi
          ...
          5 -> \@classv
        end case
        \@lastchclass := \@chclass
      od
    case of \@lastchclass
      0 -> \hskip \arraycolsep           % lrc
      1 ->                                % l
      2 -> \@preamerr1 % 'Missing @-exp' % @
      3 -> \@preamerr2 % 'Missing p-arg' % p
      4 ->                                % @-exp
      5 -> \hskip \arraycolsep           % p-exp
    end case
  END
```

```
\@arrayclassz ==
  BEGIN
    \@preamble := \@preamble *
    case of \@lastchclass
      0 -> \hskip \arraycolsep \@addamp \hskip \arraycolsep
      1 -> \@addamp \hskip \arraycolsep
      2 -> % impossible
```

```

        3 -> % impossible
        4 -> \@addamp
        5 -> \hskip \arraycolsep \@addamp \hskip \arraycolsep
        6 -> \@addamp \hskip \arraycolsep
    end case
* case of \@chnum
    0 -> \hfil$\relax\@sharp$\hfil
    1 -> $\relax\@sharp$\hfil
    2 -> \hfil$\relax\@sharp$
end case

END

\@tabclassz == similar to \@arrayclassz

\@classi ==
BEGIN
    \@preamble := \@preamble *
    case of \@lastchclass
        0 -> \hskip \arraycolsep \@arrayrule
        1 -> \hskip \doublerulesep \@arrayrule
        2 -> % impossible
        3 -> % impossible
        4 -> \@arrayrule
        5 -> \hskip \arraycolsep \@arrayrule
        6 -> \@arrayrule
    end case
END

\@classii ==
BEGIN
    \@preamble := \@preamble *
    case of \@lastchclass
        0 ->
        1 -> \hskip .5\arrayrulewidth
        2 -> % impossible
        else ->
    end case
END

\@classiii ==
BEGIN
    \@preamble := \@preamble *
    case of \@lastchclass
        0 -> \hskip \arraycolsep \@addamp \hskip \arraycolsep
        1 -> \@addamp \hskip \arraycolsep
        2 -> % impossible
        3 -> % impossible
        4 -> \@addamp
        5 -> \hskip \arraycolsep \@addamp \hskip \arraycolsep
        6 -> \@addamp \hskip \arraycolsep

```

```

                                end case
END

\@arrayclassiv ==
    BEGIN \@preamble := \@preamble * $ \@nextchar$ END

\@tabclassiv == same as \@arrayclassv except without the $ ... $

\@classv ==
    BEGIN
        \@preamble :=
            \@preamble * \@startpbox{\@nextchar}\ignorespaces\@sharp
                                \@endpbox
    END

\@expast{S}:
    Sets \reserved@a := S with all instances of *{N}{STRING}
    replaced by N copies of STRING, where N > 0. An *
    appearing inside braces is ignored, but *-expressions
    inside STRING are expanded, so nested *-expressions are
    handled properly.

\@expast{S} == BEGIN \@expast S *0x\@@ END

\@expast S1 *{N}{S2} S3 \@@ ==
    BEGIN
        \reserved@a := S1
        \@tempcnta := N
        if \@tempcnta > 0
            then while \@tempcnta > 0 do \reserved@a := \reserved@a S2
                                \@tempcnta := \@tempcnta - 1 od
                \reserved@b == \@expast
            else \reserved@b == \@exnoop
            fi
        \expandafter \reserved@b \reserved@a S3 \@@
    END
    End of historical LATEX 2.09 comments.

\@exnoop
238 \def\@exnoop #1\@@{}
    (End definition for \@exnoop.)

\@expast
239 \def\@expast#1{\@expast #1*0x\@@}
    (End definition for \@expast.)

```



```

\@xexpast
240 \def\@xexpast#1*#2#3#4\@@{%
241   \edef\reserved@a{#1}%
242   \@tempcnta#2\relax
243   \ifnum\@tempcnta>\z@
244     \@whilenum\@tempcnta>\z@do
245       {\edef\reserved@a{\reserved@a#3}\advance\@tempcnta \m@ne}%
246     \let\reserved@b\@xexpast
247   \else
248     \let\reserved@b\@xexnoop
249   \fi
250   \expandafter\reserved@b\reserved@a #4\@@}

(End definition for \@xexpast.)

\if@firstamp
  \@addamp 251 \newif\if@firstamp
252 \def\@addamp{%
253   \if@firstamp
254     \@firstampfalse
255   \else
256     \edef\@preamble{\@preamble &}%
257   \fi}

(End definition for \if@firstamp and \@addamp.)

\@arrayacol
  \@tabacol 258 \def\@arrayacol{\edef\@preamble{\@preamble \hskip \arraycolsep}}
  \@ampacol 259 \def\@tabacol{\edef\@preamble{\@preamble \hskip \tabcolsep}}
\@acolampacol 260 \def\@ampacol{\@addamp \@acol}
261 \def\@acolampacol{\@acol\@addamp\@acol}

(End definition for \@arrayacol and others.)

\@mkpream
262 \def\@mkpream#1{\@firstamptrue\@lastchclass6
263   \let\@preamble\@empty
264   \let\protect\@unexpandable@protect
265   \let\@sharp\relax
266   \let\@startpbox\relax\let\@endpbox\relax
267   \@expast{#1}%
268   \expandafter\@tfor \expandafter
269     \@nextchar \expandafter:\expandafter=\reserved@a\do
270     {\@testpach\@nextchar
271       \ifcase \@chclass \@classz \or \@classi \or \@classii \or \@classiii
272         \or \@classiv \or \@classv \fi\@lastchclass\@chclass}%
273   \ifcase \@lastchclass \@acol
274     \or \or \@preamerr \@ne\or \@preamerr \tw@\or \or \@acol \fi}

(End definition for \@mkpream.)

```

`\@arrayclassz`

```
275 \def\@arrayclassz{\ifcase \@lastchclass \@acolampacol \or \@ampacol \or
276 \or \or \@addamp \or
277 \@acolampacol \or \@firstampfalse \@acol \fi
278 \edef\@preamble{\@preamble
279 \ifcase \@chnum
280 \hfil$\relax\@sharp$\hfil \or $\relax\@sharp$\hfil
281 \or \hfil$\relax\@sharp$\fi}}
```

*(End definition for \@arrayclassz.)*

`\@tabclassz` RmS 91/08/14 inserted extra braces around entry for NFSS

```
282 \def\@tabclassz{%
283 \ifcase\@lastchclass
284 \@acolampacol
285 \or
286 \@ampacol
287 \or
288 \or
289 \or
290 \@addamp
291 \or
292 \@acolampacol
293 \or
294 \@firstampfalse\@acol
295 \fi
296 \edef\@preamble{%
297 \@preamble{%
298 \ifcase\@chnum
299 \hfil
300 \hskip1sp%
301 \ignorespaces\@sharp\unskip\hfil
302 \or
303 \hskip1sp\ignorespaces\@sharp\unskip\hfil
304 \or
305 \hfil\hskip1sp\ignorespaces\@sharp\unskip
306 \fi}}}
```

*(End definition for \@tabclassz.)*

`\@classi`

```
307 \def\@classi{%
308 \ifcase\@lastchclass
309 \@acol\@arrayrule
310 \or
311 \@addtopreamble{\hskip \doublerulesep}\@arrayrule
312 \or
313 \or
314 \or
315 \@arrayrule
316 \or
317 \@acol\@arrayrule
318 \or
```

```

319     \@arrayrule
320     \fi}

(End definition for \@classi.)

\@classii

321 \def\@classii{%
322   \ifcase\@lastchclass
323   \or
324   \@addtopreamble{\hskip .5\arrayrulewidth}%
325   \fi}

(End definition for \@classii.)

\@classiii

326 \def\@classiii{\ifcase \@lastchclass \@acolampacol \or
327   \@addamp\@acol \or
328   \or \or \@addamp \or
329   \@acolampacol \or \@ampacol \fi}

(End definition for \@classiii.)

\@tabclassiv

330 \def\@tabclassiv{\@addtopreamble\@nextchar}

(End definition for \@tabclassiv.)

\@arrayclassiv

331 \def\@arrayclassiv{\@addtopreamble{$\@nextchar$}}

(End definition for \@arrayclassiv.)

\@classv

332 \def\@classv{\@addtopreamble{\@startpbox{\@nextchar}\ignorespaces
333   \@sharp\@endpbox}}

(End definition for \@classv.)

\@addtopreamble

334 \def\@addtopreamble#1{\edef\@preamble{\@preamble #1}}

(End definition for \@addtopreamble.)

\@chclass
\@lastchclass
\@chnum
335 \newcount\@chclass
336 \newcount\@lastchclass
337 \newcount\@chnum

(End definition for \@chclass, \@lastchclass, and \@chnum.)

\arraycolsep
\@tabcolsep
\arrayrulewidth
\@doublerulesep
338 \newdimen\arraycolsep
339 \newdimen\@tabcolsep
340 \newdimen\arrayrulewidth
341 \newdimen\@doublerulesep

```

(End definition for \arraycolsep and others.)

\arraystretch

```
342 \def\arraystretch{1} % Default value.
```

(End definition for \arraystretch.)

\@arstrutbox

\@arstrut

```
343 \newbox\@arstrutbox
```

```
344 \def\@arstrut{%
```

```
345 \relax\ifmmode\copy\@arstrutbox\else\unhcopy\@arstrutbox\fi}
```

(End definition for \@arstrutbox and \@arstrut.)

\@arrayrule

```
346 \def\@arrayrule{\@addtopreamble{\hskip -.5\arrayrulewidth
```

```
347 \vrule \@width \arrayrulewidth\hskip -.5\arrayrulewidth}}
```

(End definition for \@arrayrule.)

\@testpatch

```
348 \def\@testpach#1{\@chclass \ifnum \@lastchclass=\tw@ 4 \else
```

```
349 \ifnum \@lastchclass=3 5 \else
```

```
350 \z@ \if #1c\@chnum \z@ \else
```

```
351 \if #1l\@chnum \@ne \else
```

```
352 \if #1r\@chnum \tw@ \else
```

```
353 \@chclass \if #1|\@ne \else
```

```
354 \if #1@\tw@ \else
```

```
355 \if #1p3 \else \z@ \@preamerr 0\fi
```

```
356 \fi \fi \fi \fi \fi \fi
```

```
357 \fi}
```

(End definition for \@testpatch.)

\hline

```
358 \def\hline{%
```

```
359 \noalign{\ifnum0='}\fi\hrule \@height \arrayrulewidth \futurelet
```

```
360 \reserved@a\@xhline}
```

(End definition for \hline.)

\@xhline

```
361 \def\@xhline{\ifx\reserved@a\hline
```

```
362 \vskip\doublerulesep
```

Measure from the middle of the rules.

```
363 \vskip-\arrayrulewidth
```

```
364 \fi
```

```
365 \ifnum0='{ \fi}}
```

(End definition for \@xhline.)

\vline

```
366 \def\vline{\vrule \@width \arrayrulewidth}
```

(End definition for \vline.)

`\cline` The old L<sup>A</sup>T<sub>E</sub>X2.09 implementation of `\cline` used up quite a lot of memory and two precious count registers. This new (1995/09/14) implementation does not use any count registers. It is coded in a way that depends heavily on the definition of `\multispan` so that command has been moved here from the file `ltplain.dtx`.

These counters are no longer declared.

`\newcount\@cla`

`\newcount\@clb`

367 `\def\cline#1{\@cline#1\@nil}`

368 `\def\@cline#1-#2\@nil{%`

369 `\omit`

Use the counter from `\multispan`.

370 `\@multicnt#1%`

371 `\advance\@multispan\m@ne`

372 `\ifnum\@multicnt=\@ne\@firstofone{&\omit}\fi`

373 `\@multicnt#2%`

374 `\advance\@multicnt-#1%`

375 `\advance\@multispan\@ne`

The original had `\unskip` at this point, but how could a skip get here ???

376 `\leaders\hrule\@height\arrayrulewidth\hfill`

377 `\cr`

This is back spacing is fairly horrible, but it is what happened in the old version... An alternative would be to make `\cline` look ahead for a following `\cline` as does `\hline`. This would alter the spacing in existing documents so keep the old version in the kernel. Perhaps a package should do this differently.

378 `\noalign{\vskip-\arrayrulewidth}}`

(End definition for `\cline` and `\@cline`.)

`\mscount` The `\mscount` counter is no longer declared, saving a csname and a register. It is declared in compatibility mode.

(End definition for `\mscount`.)

`\multispan` Modify `\multispan` slightly from its plain T<sub>E</sub>X definition to allow more efficient code sharing with `\multicolumn`. Also share a count register with `\multitup`.

`\@multispan` `\sp@n` 379 `\def\multispan{\omit\@multispan}`

380 `\def\@multispan#1{%`

381 `\@multicnt#1\relax`

382 `\loop\ifnum\@multicnt>\@ne \sp@n\repeat}`

383 `\def\sp@n{\span\omit\advance\@multicnt\m@ne}`

(End definition for `\multispan`, `\@multispan`, and `\sp@n`.)

`\@startpbox` Helper macros for ‘p’ columns.

`\@endpbox` `\@startpbox{<width>} text \egroup` is essentially `\parbox{<width>}{<text>}`

`\@endpbox` is essentially `\unskip \strut \par \egroup\hfil` (Changed 14 Jan 89) (changed again 1994/05/13)

384 `\def\@startpbox#1{\vtop\bgroup \setlength\hsize{#1}\@arrayparboxrestore}`

```
385 \def\@endpbox{\@finalstrut\@arstrutbox\par\egroup\hfil}
```

14 Jan 89: Def of \@endpbox changed from  
`\def\@endpbox{\par\vskip\dp\@arstrutbox\egroup\hfil}`  
so vertical spacing works out right if the last line of a ‘p’ entry has a descender.

*(End definition for \@startpbox and \@endpbox.)*

```
\@@startpbox
```

```
\@@endpbox
```

```
386 \let\@@startpbox=\@startpbox
```

```
387 \let\@@endpbox=\@endpbox
```

*(End definition for \@@startpbox and \@@endpbox.)*

```
388 </2ekernel>
```

# File M

## ltpictur.dtx

### 1 Picture Mode

Picture mode commands. In addition to the commands available in L<sup>A</sup>T<sub>E</sub>X2.09, This section adds the new `\qbezier` command for drawing curves.

`\qbezier`     `\qbezier[ $N$ ]( $\langle AX,AY \rangle$ )( $\langle BX,BY \rangle$ )( $\langle CX,CY \rangle$ )` plots a quadratic Bezier curve from ( $\langle AX,AY \rangle$ ) to ( $\langle CX,CY \rangle$ ), with ( $\langle BX,BY \rangle$ ) as the third Bezier point, using  $N+1$  points equally spaced parametrically. If  $N = 0$  (the default value), then a sufficient number of points are used to draw a connected curve—except that at most `\qbeziermax+1` points are drawn. A “point” is a square of side `\@wholewidth`.

`\bezier`     In addition, to be compatible with the old `bezier` package, a variant of this command, `\bezier`, is defined, in which the first argument is not optional.

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

<code>\unitlength</code>	= value of dimension argument
<code>\@wholewidth</code>	= current line width
<code>\@halfwidth</code>	= half of current line width
<code>\@linefnt</code>	= font for drawing lines
<code>\@circlefnt</code>	= font for drawing circles

`\linethickness{DIM}` : Sets the width of horizontal and vertical lines in a picture to DIM. Does not change width of slanted lines or circles. Width of all lines reset by `\thinlines` and `\thicklines`

```
\picture(XSIZE,YSIZE)(XORG,YORG)
  BEGIN
    \@picht :=L YSIZE * \unitlength
    box \@picbox :=
      \hb@xt@ XSIZE * \unitlength
      {\hskip -XORG * \unitlength
       \lower YORG * \unitlength
       \hbox{
         \ignorespaces      %% added 13 June 89
       }
    }
  END
```

```
\endpicture ==
  BEGIN
    } \hss }
    height of \@picbox := \@picht
    depth of \@picbox := 0
    \mbox{\box\@picbox}    %% change 26 Aug 91
  END
```

```
\put(X, Y){OBJ} ==
  BEGIN
```

```

\@killglue
\raise Y * \unitlength \hb@xt@ 0pt { \hskip X * \unitlength
                                OBJ \hss }

\ignorespaces
END

\multiput(X,Y)(DELX,DELY){N}{OBJ} ==
BEGIN
\@killglue
\@multicnt := N
\@xdim := X * \unitlength
\@ydim := Y * \unitlength
while \@multicnt > 0
do \raise \@ydim \hb@xt@ 0pt { \hskip \@xdim
                                OBJ \hss }

\@multicnt := \@multicnt - 1
\@xdim := \@xdim + DELX * \unitlength
\@ydim := \@ydim + DELY * \unitlength
od
\ignorespaces
END

```

`\shortstack[POS]{TEXT}` : Makes a `\vbox` containing TEXT stacked as a one-column array, positioned l, r or c as indicated by POS.

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

The ‘2ekernel’ code ensures that a `\usepackage{autopict}` is essentially ignored if a ‘full’ format is being used that has picture mode already in the format.

```
1 <2ekernel>\expandafter\let\csname ver@autopict.sty\endcsname\fmtversion
```

```

\@wholewidth
\@halfwidth 2 <*2ekernel>
3 \newdimen\@wholewidth
4 \newdimen\@halfwidth

(End definition for \@wholewidth and \@halfwidth.)

```

```

\unitlength
5 \newdimen\unitlength \unitlength =1pt

(End definition for \unitlength.)

```

```

\@picbox
\@picht 6 \newbox\@picbox
7 \newdimen\@picht

(End definition for \@picbox and \@picht.)

```



`\@defaultunitsset` Set a length register, #1, accepting number or an etex length expression, #2, with default unit, #3.

The register name in #1 can be prefixed by `\advance` so that the register is incremented by the supplied value.

`\@defaultunitsset{\advance\@vxx}{\textwidth-15pt}\unitlength`

#3 can be a literal unit such as `cm` or a length register such as `\unitlength`.

This is used in all `picture` commands that take picture coordinates. So `\put(2,2)` as previously but now `\put(\textwidth-5cm,0.4\textheight)` Note that you can only use expressions with lengths, `\put(1+2,0)` is not supported.

```

8 </2ekernel>
9 <*2ekernel | latexrelease>
10 <latexrelease>\IncludeInRelease{2020/10/01}%
11 <latexrelease>          {\@defaultunitsset}{default units}%
12 \def\@defaultunitsset#1#2#3{%
13   \@defaultunits#1\dimexpr#2#3\relax\relax\@nnil}
14 </2ekernel | latexrelease>

15 <latexrelease>\EndIncludeInRelease
16 <latexrelease>\IncludeInRelease{0000/00/00}%
17 <latexrelease>          {\@defaultunitsset}{default units}%
18 <latexrelease>\let\@defaultunitsset\undefined
19 <latexrelease>\EndIncludeInRelease
20 <*2ekernel>

```

*(End definition for \@defaultunitsset.)*

`\picture` #1 should be white space.

#1 should be a ( (eating any white space before the bracket),

```

\pictur@
21 \long\def\picture#1{\pictur@#1}
22 \def\pictur@(#1){%
23   \ifnextchar({\@picture(#1)}{\@picture(#1)(0,0)}}

```

*(End definition for \picture and \pictur@.)*

`\@picture`

```

24 </2ekernel>
25 <*2ekernel | latexrelease>
26 <latexrelease>\IncludeInRelease{2020/10/01}%
27 <latexrelease>          {\@picture}{default units}%
28 \def\@picture(#1,#2)(#3,#4){%
29   \@defaultunitsset\@picht{#2}\unitlength
30   \@defaultunitsset\@tempdimc{#1}\unitlength
31   \setbox\@picbox\hbext@\@tempdimc\bgroup
32     \@defaultunitsset\@tempdimc{#3}\unitlength
33     \hskip -\@tempdimc
34     \@defaultunitsset\@tempdimc{#4}\unitlength
35     \lower\@tempdimc\hbox\bgroup
36     \ignorespaces}
37 </2ekernel | latexrelease>

```

```

38 <latexrelease>\EndIncludeInRelease
39 <latexrelease>\IncludeInRelease{0000/00/00}%
40 <latexrelease>          {\@picture}{default units}%
41 <latexrelease>\def\@picture(#1,#2)(#3,#4){%
42 <latexrelease>  \picht#2\unitlength
43 <latexrelease>  \setbox\@picbox\hb@xt@#1\unitlength\bgroup
44 <latexrelease>    \hskip -#3\unitlength
45 <latexrelease>    \lower #4\unitlength\hbox\bgroup
46 <latexrelease>      \ignorespaces}
47 <latexrelease>\EndIncludeInRelease
48 <*2ekernel>

```

(End definition for \@picture.)

\endpicture

```

49 \def\endpicture{%
50   \egroup\hss\egroup
51   \ht\@picbox\@picht\dp\@picbox\z@
52   \mbox{\box\@picbox}}

```

(End definition for \endpicture.)

In the definitions of \put and \multiput, \hskip was replaced by \kern just in case arg #3 = “plus”. (Bug detected by Don Knuth. changed 20 Jul 87).

```

53 </2ekernel>
54 <*2ekernel | latexrelease>
55 <latexrelease>\IncludeInRelease{2020/10/01}%
56 <latexrelease>          {\put}{default units}%
57 <latexrelease>\expandafter\let\csname put \endcsname \@undefined
58 \long\def\put(#1,#2)#3{%
59   \@killglue
60   \@defaultunitsset\@tempdimc{#2}\unitlength
61   \raise\@tempdimc
62   \hb@xt@\z@{%
63     \@defaultunitsset\@tempdimc{#1}\unitlength
64     \kern\@tempdimc
65     #3\hss}%
66   \ignorespaces}
67 </2ekernel | latexrelease>
68 <latexrelease>\EndIncludeInRelease
69 <latexrelease>\IncludeInRelease{0000/00/00}%
70 <latexrelease>          {\put}{default units}%
71 <latexrelease>\expandafter\let\csname put \endcsname \@undefined
72 <latexrelease>\long\def\put(#1,#2)#3{%
73 <latexrelease>  \@killglue\raise#2\unitlength
74 <latexrelease>  \hb@xt@\z@{\kern#1\unitlength #3\hss}%
75 <latexrelease>  \ignorespaces}
76 <latexrelease>\EndIncludeInRelease
77 <*2ekernel>

```

\multiput #3 had better be a (.)

```

78 </2ekernel>
79 <*2ekernel | latexrelease>
80 <latexrelease>\IncludeInRelease{2020/10/01}%

```

```

81 <latexrelease>                {\multiput}{default units}%
82 <latexrelease>\expandafter\let\csname multiput \endcsname \@undefined
83 \def\multiput(#1,#2)#3{%
84   \@defaultunitsset\@xdim{#1}\unitlength
85   \@defaultunitsset\@ydim{#2}\unitlength
86   \@multiput{ }
87 </2ekernel | latexrelease>

88 <latexrelease>\EndIncludeInRelease
89 <latexrelease>\IncludeInRelease{0000/00/00}%
90 <latexrelease>                {\multiput}{default units}%
91 <latexrelease>\expandafter\let\csname multiput \endcsname \@undefined
92 <latexrelease>\def\multiput(#1,#2)#3{%
93 <latexrelease>   \@xdim #1\unitlength
94 <latexrelease>   \@ydim #2\unitlength
95 <latexrelease>   \@multiput{ }
96 <latexrelease>\EndIncludeInRelease
97 <*2ekernel>

```

(End definition for \multiput.)

\@multiput

```

98 </2ekernel>
99 <*2ekernel | latexrelease>
100 <latexrelease>\IncludeInRelease{2020/10/01}%
101 <latexrelease>                {\@multiput}{default units}%
102 \long\def\@multiput(#1,#2)#3#4{%
103   \@killglue\@multicnt #3\relax
104   \@whilenum \@multicnt >\z@ \do
105     {\raise\@ydim\hb@xt@{\z@}{\kern\@xdim #4\hss}%
106     \advance\@multicnt\m@ne
107     \@defaultunitsset{\advance\@xdim}{#1}\unitlength
108     \@defaultunitsset{\advance\@ydim}{#2}\unitlength}%
109   \ignorespaces}
110 </2ekernel | latexrelease>

111 <latexrelease>\EndIncludeInRelease
112 <latexrelease>\IncludeInRelease{0000/00/00}%
113 <latexrelease>                {\@multiput}{default units}%
114 <latexrelease>\long\def\@multiput(#1,#2)#3#4{%
115 <latexrelease>   \@killglue\@multicnt #3\relax
116 <latexrelease>   \@whilenum \@multicnt >\z@ \do
117 <latexrelease>     {\raise\@ydim\hb@xt@{\z@}{\kern\@xdim #4\hss}%
118 <latexrelease>     \advance\@multicnt\m@ne
119 <latexrelease>     \advance\@xdim#1\unitlength\advance\@ydim#2\unitlength}%
120 <latexrelease>   \ignorespaces}
121 <latexrelease>\EndIncludeInRelease
122 <*2ekernel>

```

(End definition for \@multiput.)

\@killglue

```

123 \def\@killglue{\unskip\@whiledim \lastskip >\z@ \do{\unskip}}

```

(End definition for \@killglue.)

```

\thinlines
\thicklines
124 \DeclareRobustCommand\thinlines{\let\@linefnt\tenln
125 \let\@circlefnt\tencirc
126 \@wholewidth\fontdimen8\tenln \@halfwidth .5\@wholewidth}
127 \DeclareRobustCommand\thicklines{\let\@linefnt\tenlnw
128 \let\@circlefnt\tencircw
129 \@wholewidth\fontdimen8\tenlnw \@halfwidth .5\@wholewidth}

(End definition for \thinlines and \thicklines.)

\linethickness

130 \DeclareRobustCommand*\linethickness[1]
131 {\@wholewidth #1\relax \@halfwidth .5\@wholewidth \ignorespaces}

(End definition for \linethickness.)

\ishortstack

132 \def\shortstack{\@ifnextchar[\@shortstack{\@shortstack[c]}}

(End definition for \ishortstack.)

\@ishortstack

133 \def\@shortstack[#1]{%
134 \leavevmode
135 \vbox\bgroup
136 \baselineskip-\p@\lineskip 3\p@
137 \let\mb@l\hss\let\mb@r\hss
138 \expandafter\let\csname mb@#1\endcsname\relax
139 \let\\\@stackcr
140 \@ishortstack}

(End definition for \@ishortstack.)

\@ishortstack

141 \def\@ishortstack#1{\ialign{\mb@l {##}\unskip\mb@r\cr #1\cr}\egroup}

(End definition for \@ishortstack.)

\@stackcr
\@ixstackcr
142 \protected\def\@stackcr{\@ifstar\@ixstackcr\@ixstackcr}
143 \def\@ixstackcr{\@ifnextchar[\@istackcr{\cr\ignorespaces}}

(End definition for \@stackcr and \@ixstackcr.)

\@istackcr

144 </2ekernel>
145 <*2ekernel | latexrelease>
146 <latexrelease>\IncludeInRelease{2020/10/01}%
147 <latexrelease> {\@istackcr}{\shortstack calc support}%
148 \def\@istackcr[#1]{\cr\noalign{\@vspace@calcify{#1}}\ignorespaces}
149 </2ekernel | latexrelease>

```

```

150 <latexrelease>\EndIncludeInRelease
151 <latexrelease>\IncludeInRelease{0000/00/00}%
152 <latexrelease>{\@istackcr}{\shortstack calc support}%
153 <latexrelease>
154 <latexrelease>\def\@istackcr[#1]{\cr\noalign{\vskip #1}\ignorespaces}
155 <latexrelease>\EndIncludeInRelease
156 <*2ekernel>

(End definition for \@istackcr.)
Historical LATEX 2.09 comments (not necessarily accurate any more):
\line(X,Y){LEN} ==
BEGIN
  \@xarg := X
  \@yarg := Y
  \@linelen := LEN * \unitlength
  if \@xarg = 0
    then \@vline
    else if \@yarg = 0
      then \@hline
      else \@sline
    if
  if
END

\@sline ==
BEGIN
  if \@xarg < 0
    then @negarg := T
      \@xarg := -\@xarg
      \@yyarg := -\@yarg
    else @negarg := F
      \@yyarg := \@yarg
  fi
  \@tempcnta := |\@yyarg|
  if \@tempcnta > 6
    then error: 'LATEX ERROR: Illegal \line or \vector argument.'
      \@tempcnta := 0
  fi
  \box\@linechar := \hbox{\@linefont \@getlinechar(\@xarg,\@yyarg) }
  if \@yarg > 0 then \@upordown = \raise
    \@clnht := 0
  else \@upordown = \lower
    \@clnht := height of \box\@linechar
  fi
  \@clnwd := width of \box\@linechar
  if @negarg
    then \hskip - width of \box\@linechar
      \reserved@a == \hskip - 2* width of box \@linechar
    else \reserved@a == \relax
  fi
  %% Put out integral number of line segments

```

```

while \@clnwd < \@linelen
do \@upordown \@clnht \copy\@linechar
\reserved@a
\@clnht := \@clnht + ht of \box\@linechar
\@clnwd := \@clnwd + width of \box\@linechar
od

%% Put out last segment
\@clnht := \@clnht - height of \box\@linechar
\@clnwd := \@clnwd - width of \box\@linechar
\@tempdima := \@linelen - \@clnwd
\@tempdimb := \@tempdima - width of \box\@linechar
if @negarg then \hskip -\@tempdimb
else \hskip \@tempdimb
fi
\@tempdima := 1000 * \@tempdima
\@tempcnta := \@tempdima / width of \box\@linechar
\@tempdima := (\@tempcnta * ht of \box\@linechar)/1000
\@clnht := \@clnht + \@tempdima
if \@linelen < width of \box\@linechar
then \hskip width of \box\@linechar
else \hbox{\@upordown \@clnht \copy\@linechar}
fi
END

\@hline ==
BEGIN
if \@xarg < 0 then \hskip -\@linelen \fi
\vrule height \@halfwidth depth \@halfwidth width \@linelen
if \@xarg < 0 then \hskip -\@linelen \fi
END

\@vline == if \@yarg < 0 \@downline else \@upline fi

\@getlinechar(X,Y) ==
BEGIN
\@tempcnta := 8*X - 9
if Y > 0
then \@tempcnta := \@tempcnta + Y
else \@tempcnta := \@tempcnta - Y + 64
fi
\char\@tempcnta
END

\vector(X,Y){LEN} ==
BEGIN
\@xarg := X
\@yarg := Y
\@linelen := LEN * \unitlength

```

```

if \@xarg = 0
  then \@vvector
  else if \@yarg = 0
    then \@hvector
    else \@svector
  if
if
END

\@hvector ==
BEGIN
  \@hline
  {\@linefmt if \@xarg < 0 then \@getlarrow(1,0)
    else \@getrarrow(1,0)
  fi}
END

\@vvector == if \@yarg < 0 \@downvector else \@upvector fi

\@svector ==
BEGIN
  \@sline
  \@tempcnta := | \@yarg |
  if \@tempcnta < 5
    then \hskip - width of \box\@linechar
      \@upordown \@clnht \hbox
        {\@linefmt
          if @negarg then \@getlarrow(\@xarg,\@yyarg)
            else \@getrarrow(\@xarg,\@yyarg)
          fi }
    else error: 'LATEX ERROR: Illegal \line or \vector argument.'
  fi
END

\@getlarrow(X,Y) ==
BEGIN
  if Y = 0
    then \@tempcnta := '33
  else \@tempcnta := 16 * X - 9
    \@tempcntb := 2 * Y
    if \@tempcntb > 0
      then \@tempcnta := \@tempcnta + \@tempcntb
      else \@tempcnta := \@tempcnta - \@tempcntb + 64
    fi
  fi
  \char\@tempcnta
END

\@getrarrow(X,Y) ==
BEGIN

```

```

\@tempcntb := |Y|
case of \@tempcntb
  0 : \@tempcnta := '55
  1 : if X < 3
      then \@tempcnta := 24*X - 6
      else if X = 3
          then \@tempcnta := 49
          else \@tempcnta := 58   fi
      fi
  2 : if X < 3
      then \@tempcnta := 24*X - 3
      else \@tempcnta := 51      % X must = 3
      fi
  3 : \@tempcnta := 16*X - 2
  4 : \@tempcnta := 16*X + 7
endcase
if Y < 0
  then \@tempcnta := \@tempcnta + 64
  fi
\char\@tempcnta
END

```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

`\if@negarg`

```

157 \newif\if@negarg

```

*(End definition for \if@negarg.)*

`\line`

```

158 </2ekernel>
159 <*2ekernel | latexrelease>
160 <latexrelease>\IncludeInRelease{2020/10/01}%
161 <latexrelease>          {\line}{default units}%
162 <latexrelease>\expandafter\let\csname line \endcsname\@undefined
163 \def\line(#1,#2)#3{\@xarg #1\relax \@yarg #2\relax
164   \@defaultunitsset\@linelen{#3}\unitlength
165   \ifdim\@linelen<\z@\@badlinearg\else
166     \ifnum\@xarg =\z@ \@vline
167     \else \ifnum\@yarg =\z@ \@hline \else \@sline\fi
168   \fi
169   \fi}
170 </2ekernel | latexrelease>

171 <latexrelease>\EndIncludeInRelease
172 <latexrelease>\IncludeInRelease{0000/00/00}%
173 <latexrelease>          {\line}{default units}%
174 <latexrelease>\expandafter\let\csname line \endcsname\@undefined
175 <latexrelease>\def\line(#1,#2)#3{\@xarg #1\relax \@yarg #2\relax
176 <latexrelease>   \@linelen #3\unitlength
177 <latexrelease>   \ifdim\@linelen<\z@\@badlinearg\else
178 <latexrelease>     \ifnum\@xarg =\z@ \@vline
179 <latexrelease>     \else \ifnum\@yarg =\z@ \@hline \else \@sline\fi
180 <latexrelease>     \fi

```



```

181 <latexrelease> \fi}
182 <latexrelease>\EndIncludeInRelease
183 <*2ekernel>

```

(End definition for \line.)

\@sline

```

184 \def\@sline{%
185   \ifnum\@xarg<\z@ \@negargtrue \@xarg -\@xarg \@yyarg -\@yarg
186   \else \@negargfalse \@yyarg \@yarg \fi
187   \ifnum \@yyarg >\z@ \@tempcnta\@yyarg \else \@tempcnta -\@yyarg \fi
188   \ifnum\@tempcnta>6 \@badlinearg\@tempcnta\z@ \fi
189   \ifnum\@xarg>6 \@badlinearg\@xarg \@one \fi
190   \setbox\@linechar\hbox{\@linefnt\@getlinechar(\@xarg,\@yyarg)}%

```

If we have something like \line(5,5){30} the \@linechar will not contain a char and later on we will end in an infinite loop. So we check the width of the box and put in something as an emergency fix if necessary.

```

191 \ifdim\wd\@linechar=\z@
192   \setbox\@linechar\hbox{.}%
193   \@badlinearg
194 \fi
195 \ifnum \@yarg >\z@ \let\@upordown\raise \@clnht\z@
196   \else\let\@upordown\lower \@clnht \ht\@linechar\fi
197 \@clnwd \wd\@linechar
198 \if@negarg
199   \hskip -\wd\@linechar \def\reserved@a{\hskip -2\wd\@linechar}%
200 \else
201   \let\reserved@a\relax
202 \fi
203 \@whiledim \@clnwd <\@linelen \do
204   {\@upordown\@clnht\copy\@linechar
205     \reserved@a
206     \advance\@clnht \ht\@linechar
207     \advance\@clnwd \wd\@linechar}%
208 \advance\@clnht -\ht\@linechar
209 \advance\@clnwd -\wd\@linechar
210 \@tempdima\@linelen\advance\@tempdima -\@clnwd
211 \@tempdimb\@tempdima\advance\@tempdimb -\wd\@linechar
212 \if@negarg \hskip -\@tempdimb \else \hskip \@tempdimb \fi
213 \multiply\@tempdima \@m
214 \@tempcnta \@tempdima
215 \@tempdima \wd\@linechar \divide\@tempcnta \@tempdima
216 \@tempdima \ht\@linechar \multiply\@tempdima \@tempcnta
217 \divide\@tempdima \@m
218 \advance\@clnht \@tempdima
219 \ifdim \@linelen <\wd\@linechar
220   \hskip \wd\@linechar

```

Warn if line gets so short that it can't be printed. But don't warn if it is exactly zero since that was probably deliberate (e.g., to get a vector head only).

```

221 \ifdim \@linelen = \z@
222 \else
223   \@picture@warn
224 \fi

```

```
225 \else\@upordown\@clnht\copy\@linechar\fi}
```

(End definition for \@sline.)

\@hline

```
226 \def\@hline{\ifnum \@xarg <\z@ \hskip -\@linelen \fi
227 \vrule \@height \@halfwidth \@depth \@halfwidth \@width \@linelen
228 \ifnum \@xarg <\z@ \hskip -\@linelen \fi}
```

(End definition for \@hline.)

\@getlinechar

```
229 \def\@getlinechar(#1,#2){\@tempcnta#1\relax\multiply\@tempcnta 8%
230 \advance\@tempcnta -9\ifnum #2>\z@ \advance\@tempcnta #2\relax\else
231 \advance\@tempcnta -#2\relax\advance\@tempcnta 64 \fi
232 \char\@tempcnta}
```

(End definition for \@getlinechar.)

\vector

```
233 </2ekernel>
234 <*2ekernel | latexrelease>
235 <latexrelease>\IncludeInRelease{2020/10/01}%
236 <latexrelease> \{\vector\}{default units}%
237 <latexrelease>\expandafter\let\csname vector \endcsname\@undefined
238 \def\vector(#1,#2)#3{\@xarg #1\relax \@yarg #2\relax
239 \@tempcnta \ifnum\@xarg<\z@ -\@xarg\else\@xarg\fi
240 \ifnum\@tempcnta<5\relax
241 \@defaultunitsset\@linelen{#3}\unitlength
242 \ifdim\@linelen<\z@\@badlinearg\else
243 \ifnum\@xarg =\z@ \@vvector
244 \else \ifnum\@yarg =\z@ \@hvector \else \@svector\fi
245 \fi
246 \fi
247 \else\@badlinearg\fi}
248 </2ekernel | latexrelease>
249 <latexrelease>\EndIncludeInRelease
250 <latexrelease>\IncludeInRelease{0000/00/00}%
251 <latexrelease> \{\vector\}{default units}%
252 <latexrelease>\expandafter\let\csname vector \endcsname\@undefined
253 <latexrelease>\def\vector(#1,#2)#3{\@xarg #1\relax \@yarg #2\relax
254 <latexrelease> \@tempcnta \ifnum\@xarg<\z@ -\@xarg\else\@xarg\fi
255 <latexrelease> \ifnum\@tempcnta<5\relax
256 <latexrelease> \@linelen #3\unitlength
257 <latexrelease> \ifdim\@linelen<\z@\@badlinearg\else
258 <latexrelease> \ifnum\@xarg =\z@ \@vvector
259 <latexrelease> \else \ifnum\@yarg =\z@ \@hvector \else \@svector\fi
260 <latexrelease> \fi
261 <latexrelease> \fi
262 <latexrelease> \else\@badlinearg\fi}
263 <latexrelease>\EndIncludeInRelease
264 <*2ekernel>
```

(End definition for \vector.)

```

\@hvector
265 \def\@hvector{\@hline\hb@xt@\z@\@linefnt
266 \ifnum \@xarg <\z@ \@getlarrow(1,0)\hss\else
267 \hss\@getrarrow(1,0)\fi}}

(End definition for \@hvector.)

\@vvector
268 \def\@vvector{\ifnum \@yarg <\z@ \@downvector \else \@upvector \fi}

(End definition for \@vvector.)

\@svector
269 \def\@svector{\@sline
270 \@tempcnta\@yarg \ifnum\@tempcnta <\z@ \@tempcnta -\@tempcnta\fi
271 \ifnum\@tempcnta <5%
272 \hskip -\wd\@linechar
273 \upordown\@clnht \hbox{\@linefnt \if@negarg
274 \@getlarrow(\@xarg,\@yyarg)\else \@getrarrow(\@xarg,\@yyarg)\fi}%
275 \else\@badlinearg\fi}

(End definition for \@svector.)

\@getlarrow
276 \def\@getlarrow(#1,#2){\ifnum #2=\z@ \@tempcnta 27 % '33
277 \else
278 \@tempcnta #1\relax\multiply\@tempcnta \sixt@@n
279 \advance\@tempcnta -9 \@tempcntb #2\relax\multiply\@tempcntb \tw@
280 \ifnum \@tempcntb >\z@ \advance\@tempcnta \@tempcntb
281 \else\advance\@tempcnta -\@tempcntb\advance\@tempcnta 64
282 \fi\fi\char\@tempcnta}

(End definition for \@getlarrow.)

\@getrarrow
283 \def\@getrarrow(#1,#2){\@tempcntb #2\relax
284 \ifnum\@tempcntb <\z@ \@tempcntb -\@tempcntb\relax\fi
285 \ifcase \@tempcntb\relax \@tempcnta 45 % '55
286 \or
287 \ifnum #1<\thr@@ \@tempcnta #1\relax\multiply\@tempcnta
288 24\advance\@tempcnta -6 \else \ifnum #1=\thr@@ \@tempcnta 49
289 \else\@tempcnta 58 \fi\fi\or
290 \ifnum #1<\thr@@ \@tempcnta=#1\relax\multiply\@tempcnta
291 24\advance\@tempcnta -\thr@@ \else \@tempcnta 51 \fi\or
292 \@tempcnta #1\relax\multiply\@tempcnta
293 \sixt@@n \advance\@tempcnta -\tw@ \else
294 \@tempcnta #1\relax\multiply\@tempcnta
295 \sixt@@n \advance\@tempcnta 7 \fi\ifnum #2<\z@ \advance\@tempcnta 64 \fi
296 \char\@tempcnta}

(End definition for \@getrarrow.)

\@vline
297 \def\@vline{\ifnum \@yarg <\z@ \@downline \else \@upline\fi}

```

(End definition for \@vline.)

\@upline

```
298 \def\@upline{%
299   \hb@xt@z@{\hskip -\@halfwidth \vrule \@width \@wholewidth
300   \@height \@linelen \@depth z@\hss}}
```

(End definition for \@upline.)

\@downline

```
301 \def\@downline{%
302   \hb@xt@z@{\hskip -\@halfwidth \vrule \@width \@wholewidth
303   \@height z@ \@depth \@linelen \hss}}
```

(End definition for \@downline.)

\@upvector

```
304 \def\@upvector{\@upline\setbox\@tempboxa\hbox{\@linefnt\char 54}% '66
305   \raise \@linelen \hb@xt@z@{\lower \ht\@tempboxa\box\@tempboxa\hss}}
```

(End definition for \@upvector.)

\@downvector

```
306 \def\@downvector{\@downline\lower \@linelen
307   \hb@xt@z@{\@linefnt\char 63 % '77
308   \hss}}
```

(End definition for \@downvector.)

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

```
\dashbox{D}(X,Y) ==
BEGIN
leave vertical mode
\hb@xt@ Opt {
  \baselineskip := Opt
  \lineskip      := Opt
%% HORIZONTAL DASHES
  \@dashdim := X * \unitlength
  \@dashcnt := \@dashdim + 200 % to prevent roundoff error
  \@dashdim := D * \unitlength
  \@dashcnt := \@dashcnt / \@dashdim
  if \@dashcnt is odd
  then \@dashdim := Opt
      \@dashcnt := (\@dashcnt + 1) / 2
  else \@dashdim := \@dashdim / 2
      \@dashcnt := \@dashcnt / 2 - 1
      \box\@dashbox := \hbox{\vrule height \@halfwidth
                             depth \@halfwidth width \@dashdim}
      \put(0,0){\copy\@dashbox}
      \put(0,Y){\copy\@dashbox}
      \put(X,0){\hskip -\@dashdim\copy\@dashbox}
      \put(X,Y){\hskip -\@dashdim\box\@dashbox}
  \@dashdim := 3 * \@dashdim
fi
```

```

\box\@dashbox := \hbox{\vrule height \@halfwidth
                        depth \@halfwidth width D * \unitlength
                        \hskip D * \unitlength}

\@tempcnta := 0
\put(0,0){\hskip \@dashdim
          while \@tempcnta < \@dashcnt
            do \copy\@dashbox
              \@tempcnta := \@tempcnta + 1
            od
          }
\@tempcnta := 0
\put(0,Y){\hskip \@dashdim
          while \@tempcnta < \@dashcnt
            do \copy\@dashbox
              \@tempcnta := \@tempcnta + 1
            od
          }

%% vertical dashes
\@dashdim := Y * \unitlength
\@dashcnt := \@dashdim + 200 % to prevent roundoff error
\@dashdim := D * \unitlength
\@dashcnt := \@dashcnt / \@dashdim
if \@dashcnt is odd
then \@dashdim := 0pt
    \@dashcnt := (\@dashcnt + 1) / 2
else \@dashdim := \@dashdim / 2
    \@dashcnt := \@dashcnt / 2 - 1
    \box\@dashbox := \hbox{\hskip -\@halfwidth
                            \vrule width \@wholewidth
                            height \@dashdim }

    \put(0,0){\copy\@dashbox}
    \put(X,0){\copy\@dashbox}
    \put(0,Y){\lower\@dashdim\copy\@dashbox}
    \put(X,Y){\lower\@dashdim\copy\@dashbox}
    \@dashdim := 3 * \@dashdim
fi
\box\@dashbox := \hbox{\vrule width \@wholewidth
                        height D * \unitlength }

\@tempcnta := 0
\put(0,0){\hskip -\halfwidth
          \vbox{while \@tempcnta < \@dashcnt
                do \vskip D*\unitlength
                  \copy\@dashbox
                  \@tempcnta := \@tempcnta + 1
                od
                \vskip \@dashdim
              } }
\@tempcnta := 0
\put(X,0){\hskip -\halfwidth

```

```

        \vbox{while \@tempcnta < \@dashcnt
            do \vskip D*\unitlength
              \copy\@dashbox
              \@tempcnta := \@tempcnta + 1
            od
            \vskip \@dashdim
          }
    }
}      % END DASHES

```

\@makepicbox(X,Y)

END

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

\dashbox

```

309 \</2kernel>
310 \<*2kernel | latexrelease>
311 \<latexrelease>\IncludeInRelease{2020/10/01}%
312 \<latexrelease>{\dashbox}{default units}%
313 \<latexrelease>\expandafter\let\csname dashbox \endcsname\undefind
314 \def\dashbox#1(#2,#3){\leavevmode\hb@xt@\z@{\baselineskip \z@skip
315 \lineskip \z@skip
316 \@defaultunitsset\@dashdim{#2}\unitlength
317 \@dashcnt \@dashdim \advance\@dashcnt 200
318 \@defaultunitsset\@dashdim{#1}\unitlength
319 \divide\@dashcnt \@dashdim
320 \ifodd\@dashcnt\@dashdim \z@
321 \advance\@dashcnt \@one \divide\@dashcnt \tw@
322 \else \divide\@dashdim \tw@ \divide\@dashcnt \tw@
323 \advance\@dashcnt \m@ne
324 \setbox\@dashbox \hbox{\vrule \@height \@halfwidth \@depth \@halfwidth
325 \@width \@dashdim}\put(0,0){\copy\@dashbox}%
326 \put(0,#3){\copy\@dashbox}%
327 \put(#2,0){\hskip-\@dashdim\copy\@dashbox}%
328 \put(#2,#3){\hskip-\@dashdim\box\@dashbox}%
329 \multiply\@dashdim \thr@@
330 \fi
331 \setbox\@dashbox \hbox{%
332   \@defaultunitsset\@tempdimc{#1}\unitlength
333   \vrule \@height \@halfwidth \@depth \@halfwidth \@width \@tempdimc
334   \hskip\@tempdimc}%
335 \@tempcnta\z@
336 \put(0,0){\hskip\@dashdim \@whilenum \@tempcnta <\@dashcnt
337 \do{\copy\@dashbox\advance\@tempcnta \@one }}\@tempcnta\z@
338 \put(0,#3){\hskip\@dashdim \@whilenum \@tempcnta <\@dashcnt
339 \do{\copy\@dashbox\advance\@tempcnta \@one }}%
340 \@defaultunitsset\@dashdim{#3}\unitlength
341 \@dashcnt \@dashdim \advance\@dashcnt 200
342 \@defaultunitsset\@dashdim{#1}\unitlength
343 \divide\@dashcnt \@dashdim
344 \ifodd\@dashcnt \@dashdim \z@
345 \advance\@dashcnt \@one \divide\@dashcnt \tw@
346 \else

```

```

347 \divide\@dashdim \tw@ \divide\@dashcnt \tw@
348 \advance\@dashcnt \m@ne
349 \setbox\@dashbox\hbox{\hskip -\@halfwidth
350 \vrule \@width \@wholewidth
351 \@height \@dashdim}\put(0,0){\copy\@dashbox}%
352 \put(#2,0){\copy\@dashbox}%
353 \put(0,#3){\lower\@dashdim\copy\@dashbox}%
354 \put(#2,#3){\lower\@dashdim\copy\@dashbox}%
355 \multiply\@dashdim \thr@@
356 \fi
357 \@defaultunitsset\@tempdimb{#1}\unitlength
358 \setbox\@dashbox\hbox{%
359 \vrule \@width \@wholewidth \@height\@tempdimb}%
360 \@tempcnta\z@
361 \put(0,0){\hskip -\@halfwidth \vbox{\@whilenum \@tempcnta <\@dashcnt
362 \do{\vskip\@tempdimb\copy\@dashbox\advance\@tempcnta \@ne }%
363 \vskip\@dashdim}}\@tempcnta\z@
364 \put(#2,0){\hskip -\@halfwidth \vbox{\@whilenum \@tempcnta<\@dashcnt
365 \do{\vskip\@tempdimb\copy\@dashbox\advance\@tempcnta \@ne }%
366 \vskip\@dashdim}}\@makepicbox(#2,#3)}
367 /2ekernel | latexrelease)

368 \latexrelease\EndIncludeInRelease
369 \latexrelease\IncludeInRelease{0000/00/00}%
370 \latexrelease \dashbox{default units}%
371 \latexrelease\expandafter\let\csname dashbox \endcsname\@undefined
372 \latexrelease\def\dashbox#1(#2,#3){%
373 \latexrelease\leavevmode\hbext@z@{\baselineskip \z@skip
374 \latexrelease\lineskip \z@skip
375 \latexrelease\@dashdim #2\unitlength
376 \latexrelease\@dashcnt \dashdim \advance\@dashcnt 200
377 \latexrelease\@dashdim #1\unitlength\divide\@dashcnt \dashdim
378 \latexrelease\ifodd\@dashcnt\@dashdim \z@
379 \latexrelease\advance\@dashcnt \@ne \divide\@dashcnt \tw@
380 \latexrelease\else \divide\@dashdim \tw@ \divide\@dashcnt \tw@
381 \latexrelease\advance\@dashcnt \m@ne
382 \latexrelease\setbox\@dashbox \hbox{%
383 \latexrelease \vrule \@height \@halfwidth \@depth \@halfwidth
384 \latexrelease \@width \dashdim}\put(0,0){\copy\@dashbox}%
385 \latexrelease\put(0,#3){\copy\@dashbox}%
386 \latexrelease\put(#2,0){\hskip-\dashdim\copy\@dashbox}%
387 \latexrelease\put(#2,#3){\hskip-\dashdim\box\@dashbox}%
388 \latexrelease\multiply\@dashdim \thr@@
389 \latexrelease\fi
390 \latexrelease\setbox\@dashbox \hbox{%
391 \latexrelease \vrule \@height \@halfwidth \@depth \@halfwidth
392 \latexrelease \@width #1\unitlength\hskip #1\unitlength}\@tempcnta\z@
393 \latexrelease\put(0,0){\hskip\@dashdim \@whilenum \@tempcnta <\@dashcnt
394 \latexrelease\do{\copy\@dashbox\advance\@tempcnta \@ne }}\@tempcnta\z@
395 \latexrelease\put(0,#3){\hskip\@dashdim \@whilenum \@tempcnta <\@dashcnt
396 \latexrelease\do{\copy\@dashbox\advance\@tempcnta \@ne }}%
397 \latexrelease\@dashdim #3\unitlength
398 \latexrelease\@dashcnt \dashdim \advance\@dashcnt 200
399 \latexrelease\@dashdim #1\unitlength\divide\@dashcnt \dashdim
400 \latexrelease\ifodd\@dashcnt \dashdim \z@

```

```

401 <latexrelease>\advance\@dashcnt \@ne \divide\@dashcnt \tw@
402 <latexrelease>\else
403 <latexrelease>\divide\@dashdim \tw@ \divide\@dashcnt \tw@
404 <latexrelease>\advance\@dashcnt \m@ne
405 <latexrelease>\setbox\@dashbox\hbox{\hskip -\@halfwidth
406 <latexrelease>\vrule \@width \@wholewidth
407 <latexrelease>\@height \@dashdim}\put(0,0){\copy\@dashbox}%
408 <latexrelease>\put(#2,0){\copy\@dashbox}%
409 <latexrelease>\put(0,#3){\lower\@dashdim\copy\@dashbox}%
410 <latexrelease>\put(#2,#3){\lower\@dashdim\copy\@dashbox}%
411 <latexrelease>\multiply\@dashdim \thr@@
412 <latexrelease>\fi
413 <latexrelease>\setbox\@dashbox\hbox{\vrule \@width \@wholewidth
414 <latexrelease>\@height #1\unitlength}\@tempcnta\z@
415 <latexrelease>\put(0,0){%
416 <latexrelease> \hskip -\@halfwidth \vbox{\@whilenum \@tempcnta <\@dashcnt
417 <latexrelease> \do{\vskip #1\unitlength\copy\@dashbox
418 <latexrelease> \advance\@tempcnta\@ne }%
419 <latexrelease> \vskip\@dashdim}}\@tempcnta\z@
420 <latexrelease>\put(#2,0){%
421 <latexrelease> \hskip -\@halfwidth \vbox{\@whilenum \@tempcnta<\@dashcnt
422 <latexrelease> \do{\vskip #1\unitlength\copy\@dashbox
423 <latexrelease> \advance\@tempcnta \@ne }%
424 <latexrelease> \vskip\@dashdim}}\@makepicbox(#2,#3)}
425 <latexrelease>\EndIncludeInRelease
426 <*2kernel>

```

(End definition for \dashbox.)

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

## CIRCLES AND OVALS

### USER COMMANDS:

**\circle{D}** : Produces the circle with the diameter as close as possible to  $D * \text{\unitlength}$ . **\put(X,Y){\circle{D}}** puts the circle with its center at (X,Y).

**\oval(X,Y)** : Makes an oval as round as possible that fits in the rectangle of width  $X * \text{\unitlength}$  and height  $Y * \text{\unitlength}$ . The reference point is the center.

**\oval(X,Y)[POS]** : Save as **\oval(X,Y)** except it draws only the half or quadrant of the oval indicated by POS. E.G., **\oval(X,Y)[t]** draws just the top half and **\oval(X,Y)[br]** draws just the bottom right quadrant. In all cases, the reference point is the same as the unqualified **\oval(X,Y)** command.

**\@ovvert {DELTA1} {DELTA2}** : Makes a vbox containing either the left side or the right side of the oval being constructed. The baseline will coincide with the outside bottom edge of the oval; the left side of the box will coincide with the left edge of the vertical



rule. The width of the box will be `\@tempdima`.  
`DELTA1` and `DELTA2` are added to the character number in `\@tempcnta`  
to get the characters for the top and bottom quarter circle pieces.

`\@ovhorz` : Makes an hbox containing the straight rule for either the  
top or the bottom of the oval being constructed. The baseline  
will coincide with bottom edge of the rule; the left side of  
the box will coincide with the left side of the oval.  
The width of the box will be `\@ovxx`.

`\@getcirc {DIAM}` : Sets `\@tempcnta` to the character number  
of the top-right quarter circle with the largest  
diameter less than or equal to `DIAM`.  
Sets `\@tempboxa` to an hbox containing that character.  
Sets `\@tempdima` to `\wd \@tempboxa`, which is the distance  
from the circle's left outside edge to its right  
inside edge.  
(These characters are like those described in the  
TeXbook, pp. 389-90.)

```
\@getcirc {DIAM} ==
BEGIN
  \@tempcnta      := integer coercion of (DIAM + 2pt)
                  + 2pt added 1 Nov 88
  \@tempcnta      := \@tempcnta / integer coercion of 4pt
  if \@tempcnta > 10
    then \@tempcnta := 10 fi
  if \@tempcnta > 0
    then \@tempcnta := \@tempcnta-1
    else LaTeX Warning: Oval too small.
  fi
  \@tempcnta      := 4 * \@tempcnta
  \@tempboxa      := \hbox{\@circlefont \char \@tempcnta}
  \@tempdima      := \wd \@tempboxa
END
```

```
\@put{X}{Y}{OBJ} ==
BEGIN
  \raise Y \hb@xt@ 0pt{\hskip X OBJ \hss}
END
```

```
\@oval(X,Y)[POS] ==
BEGIN
  \beginngroup
  \boxmaxdepth := \maxdimen
  @ovt := @ovb := @ovl := @ovr := true
  for all E in POS
    do @ovE := false od
  \@ovxx      := X * \unitlength
  \@ovyy      := Y * \unitlength
```

```

\@tempdimb := min(\@ovxx,\@ovyy)
\@getcirc{\@tempdimb-2pt} %% "-2pt" added 7 Dec 89
\@ovro := \ht \@tempboxa
\@ovri := \dp \@tempboxa
\@ovdx := \@ovxx - \@tempdima
\@ovdx := \@ovdx/2
\@ovdy := \@ovyy - \@tempdima
\@ovdy := \@ovdy/2
\@circlefnt
\@tempboxa :=
  \hbox{
    if \@ovr
      then \@ovvert{3}{2} \kern -\@tempdima
    fi
    if \@ovl
      then \kern \@ovxx \@ovvert{0}{1} \kern -\@tempdima
        \kern -\@ovxx
      fi
    if \@ovt
      then \@ovhorz \kern -\@ovxx
    fi
    if \@ovb
      then \raise \@ovyy \@ovhorz
    fi
  }
\@ovdx := \@ovdx + \@ovro
\@ovdy := \@ovdy + \@ovro
\ht\@tempboxa := \dp\@tempboxa := 0
\@put{-\@ovdx}{-\@ovdy}{\box\@tempboxa}
\endgroup
END

\@ovvert {DELTA1} {DELTA2} ==
BEGIN
  \vbox to \@ovyy {
    if \@ovb
      then \@tempcntb := \@tempcnta + DELTA1
        \kern -\@ovro
        \hbox { \char \@tempcntb }
        \nointerlineskip
      else \kern \@ovri \kern \@ovdy
    fi
    \leaders \vrule width \@wholewidth \vfil
    \nointerlineskip
    if \@ovt
      then \@tempcntb := \@tempcnta + DELTA2
        \hbox { \char \@tempcntb }
      else \kern \@ovdy \kern \@ovro
    fi
  }

```

```

END

\@ovhorz ==
BEGIN
  \hb@xt@ \ovxxx{
    \kern \@ovro
    if @ovr
      then
        else \kern \@ovdx
      fi
    \leaders \hrule height \@wholewidth \hfil
    if @ovl
      then
        else \kern \@ovdx
      fi
    \kern \@ovri
  }
END

\circle{DIAM} ==
BEGIN
  \begingroup
  \boxmaxdepth := maxdimen
  \@tempdimb := DIAM *\unitlength
  if \@tempdimb > 15.5pt
    then \@getcirc{\@tempdimb}
      \@ovro := \ht \@tempboxa
      \@tempboxa := \hbox{
        \@circlefnt
        \@tempcnta := \@tempcnta + 2
        \char \@tempcnta
        \@tempcnta := \@tempcnta - 1
        \char \@tempcnta
        \kern -2\@tempdima
        \@tempcnta := \@tempcnta + 2
        \raise \@tempdima \hbox { \char \@tempcnta }
        \raise \@tempdima \box\@tempboxa
      }
      \ht\@tempboxa := \dp\@tempboxa := 0
      \@put{-\@ovro}{-\@ovro}{\@tempboxa}
    else
      \@circ{\@tempdimb}{96}
    fi
  \endgroup
END

\circle*{DIAM} == \dot{DIAM} == \@circ{DIAM*\unitlength}{112}

\@circ{DIAM}{CHAR} ==
BEGIN

```

```

    \@tempcnta := integer coercion of (DIAM + .5pt)/1pt.
    if \@tempcnta > 15 then \@tempcnta := 15 fi
    if \@tempcnta > 1 then \@tempcnta := \@tempcnta - 1 fi
    \@tempcnta := \@tempcnta + CHAR
    \@circlefnt
    \char \@tempcnta
  END

```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

```

\if@ovt If producing the Top Bottom Left or Right of an oval.
\if@ovb 427 \newif\if@ovt
\if@ovl 428 \newif\if@ovb
\if@ovr 429 \newif\if@ovl
        430 \newif\if@ovr

```

*(End definition for \if@ovt and others.)*

```

\@ovxx
\@ovyy 431 \newdimen\@ovxx
\@ovdx 432 \newdimen\@ovyy
\@ovdy 433 \newdimen\@ovdx
\@ovro 434 \newdimen\@ovdy
\@ovri 435 \newdimen\@ovro
        436 \newdimen\@ovri

```

*(End definition for \@ovxx and others.)*

\advance\@tempdima 2pt\relax added 1 Nov 88 to fix bug in which size of drawn circle not monotonic function of argument of \circle, caused by different rounding for dimensions of large and small circles.

```

\@getcirc
437 \def\@getcirc#1{\@tempdima #1\relax \advance\@tempdima 2\p@
438   \@tempcnta\@tempdima
439   \@tempdima 4\p@ \divide\@tempcnta\@tempdima
440   \ifnum \@tempcnta >10\relax
441     \@picture@warn
442     \@tempcnta 10\relax
443   \fi
444   \ifnum \@tempcnta >\z@ \advance\@tempcnta\m@ne
Warn if requirements for oval or circle can't be met.
445   \else \@picture@warn \fi
446   \multiply\@tempcnta 4\relax
447   \setbox \@tempboxa \hbox{\@circlefnt
448   \char \@tempcnta}\@tempdima \wd \@tempboxa}

```

*(End definition for \@getcirc.)*

\@picture@warn Generic warning for lines, vectors (used in \@sline) and oval or circle (used in \@getcirc) are not available at right size.

```

449 \def\@picture@warn{\@latex@warning{%
450   \string\oval, \string\circle, or \string\line\space
451   size unavailable}}

```

```

(End definition for \@picture@warn.)

\@put
452 \def\@put#1#2#3{\raise #2\hb@xt@{z@{\hskip #1#3\hss}}
(End definition for \@put.)

\oval
453 \def\oval(#1,#2){\@ifnextchar[{\@oval(#1,#2)}{\@oval(#1,#2) []}}
(End definition for \oval.)

454 </2ekernel>
455 <latexrelease>\IncludeInRelease{2016/03/31}%
456 <latexrelease>{\@ovhlinetrue}%
457 <latexrelease>{Avoid almost zero length leaders}%
458 <*2ekernel | latexrelease>

\if@ovvline Tests whether horizontal or vertical lines are needed.
\if@ovhline
459 \newif\if@ovvline \@ovvlinetrue
460 \newif\if@ovhline \@ovhlinetrue
461 % \begin{macrocode}
462 </2ekernel | latexrelease>
463 <latexrelease>\EndIncludeInRelease
464 <latexrelease>\IncludeInRelease{0000/00/00}%
465 <latexrelease>{\@ovhlinetrue}%
466 <latexrelease>{Avoid almost zero length leaders}%
467 <latexrelease>\let\if@ovvline\@undefined
468 <latexrelease>\let\if@ovhline\@undefined
469 <latexrelease>\EndIncludeInRelease
470 <*2ekernel>

(End definition for \if@ovvline and \if@ovhline.)

\@oval
471 </2ekernel>
472 <*2ekernel | latexrelease>
473 <latexrelease>\IncludeInRelease{2020/10/01}%
474 <latexrelease>{\@oval}{default units}%
475 \def\@oval(#1,#2)[#3]{\begingroup\boxmaxdepth \maxdimen
476 \@ovttrue \@ovbtrue \@ovltrue \@ovrtrue

477 \@ovvlinefalse \@ovhlinefalse

478 \@tfor\reserved@a :=#3\do{%
479 \csname @ov\reserved@a false\endcsname}%
480 \@defaultunitsset\@ovxx{#1}\unitlength
481 \@defaultunitsset\@ovyy{#2}\unitlength

482 \@tempdimb \ifdim \@ovyy >\@ovxx \@ovxx \@ovvlinetrue
483 \else \@ovyy \ifdim \@ovyy =\@ovxx \else \@ovhlinetrue \fi\fi

484 \advance \@tempdimb -2\p@
485 \@getcirc \@tempdimb
486 \@ovro \ht\@tempboxa \@ovri \dp\@tempboxa
487 \@ovdx\@ovxx \advance\@ovdx -\@tempdima \divide\@ovdx \tw@
488 \@ovdy\@ovyy \advance\@ovdy -\@tempdima \divide\@ovdy \tw@

```

```

489 \ifdim \@ovdx >\z@ \ovhlinetrue \fi
490 \ifdim \@ovdy >\z@ \ovvlinetrue \fi

491 \circlefnt \setbox\@tempboxa
492 \hbox{\if@ovr \ovvert32\kern -\@tempdima \fi
493 \if@ovl \kern \@ovxx \ovvert01\kern -\@tempdima \kern -\@ovxx \fi
494 \if@ovt \ovhorz \kern -\@ovxx \fi
495 \if@ovb \raise \@ovyy \ovhorz \fi}\advance\@ovdx\@ovro
496 \advance\@ovdy\@ovro \ht\@tempboxa\z@ \dp\@tempboxa\z@
497 \put{-\@ovdx}{-\@ovdy}{\box\@tempboxa}%
498 \endgroup}
499 </2ekernel | latexrelease>

500 <latexrelease>\EndIncludeInRelease
501 <latexrelease>\IncludeInRelease{2016/03/31}%
502 <latexrelease> \{\@oval\}{default units}%
503 <latexrelease>\def\@oval(#1,#2)[#3]{\begingroup\boxmaxdepth \maxdimen
504 <latexrelease> \@ovttrue \@ovbtrue \@ovltrue \@ovrtrue
505 <latexrelease> \@ovvlinefalse \ovhlinefalse
506 <latexrelease> \tfor\reserved@a :=#3\do{%
507 <latexrelease> \csname @ov\reserved@a false\endcsname}%
508 <latexrelease> \@ovxx #1\unitlength
509 <latexrelease> \@ovyy #2\unitlength
510 <latexrelease> \@tempdimb \ifdim \@ovyy >\@ovxx \@ovxx \@ovvlinetrue
511 <latexrelease> \else \@ovyy \ifdim \@ovyy =\@ovxx \else \ovhlinetrue
512 <latexrelease> \fi\fi
513 <latexrelease> \advance \@tempdimb -2\p@
514 <latexrelease> \getcirc \@tempdimb
515 <latexrelease> \@ovro \ht\@tempboxa \@ovri \dp\@tempboxa
516 <latexrelease> \@ovdx\@ovxx \advance\@ovdx -\@tempdima \divide\@ovdx \tw@
517 <latexrelease> \@ovdy\@ovyy \advance\@ovdy -\@tempdima \divide\@ovdy \tw@
518 <latexrelease> \ifdim \@ovdx >\z@ \ovhlinetrue \fi
519 <latexrelease> \ifdim \@ovdy >\z@ \ovvlinetrue \fi
520 <latexrelease> \circlefnt \setbox\@tempboxa
521 <latexrelease> \hbox{\if@ovr \ovvert32\kern -\@tempdima \fi
522 <latexrelease> \if@ovl
523 <latexrelease> \kern \@ovxx \ovvert01\kern -\@tempdima \kern -\@ovxx
524 <latexrelease> \fi
525 <latexrelease> \if@ovt \ovhorz \kern -\@ovxx \fi
526 <latexrelease> \if@ovb \raise \@ovyy \ovhorz \fi}\advance\@ovdx\@ovro
527 <latexrelease> \advance\@ovdy\@ovro \ht\@tempboxa\z@ \dp\@tempboxa\z@
528 <latexrelease> \put{-\@ovdx}{-\@ovdy}{\box\@tempboxa}%
529 <latexrelease> \endgroup}
530 <latexrelease>\EndIncludeInRelease

531 <latexrelease>\IncludeInRelease{0000/00/00}%
532 <latexrelease> \{\@oval\}{default units}%
533 <latexrelease>\def\@oval(#1,#2)[#3]{\begingroup\boxmaxdepth \maxdimen
534 <latexrelease> \@ovttrue \@ovbtrue \@ovltrue \@ovrtrue
535 <latexrelease> \tfor\reserved@a :=#3\do
536 <latexrelease> {\csname @ov\reserved@a false\endcsname}%
537 <latexrelease> \@ovxx #1\unitlength
538 <latexrelease> \@ovyy #2\unitlength
539 <latexrelease> \@tempdimb \ifdim \@ovyy >\@ovxx \@ovxx\else \@ovyy \fi
540 <latexrelease> \advance \@tempdimb -2\p@
541 <latexrelease> \getcirc \@tempdimb

```

```

542 <latexrelease> \ovro \ht\@tempboxa \ovri \dp\@tempboxa
543 <latexrelease> \ovdx\ovxx \advance\ovdx -\@tempdima \divide\ovdx \tw@
544 <latexrelease> \ovdy\ovyy \advance\ovdy -\@tempdima \divide\ovdy \tw@
545 <latexrelease> \circlefnt \setbox\@tempboxa
546 <latexrelease> \hbox{\if@ovr \ovvert32\kern -\@tempdima \fi
547 <latexrelease> \if@ovl
548 <latexrelease> \kern \ovxx \ovvert01\kern -\@tempdima \kern -\ovxx
549 <latexrelease> \fi
550 <latexrelease> \if@ovt \ovhorz \kern -\ovxx \fi
551 <latexrelease> \if@ovb \raise \ovyy \ovhorz \fi}\advance\ovdx\ovro
552 <latexrelease> \advance\ovdy\ovro \ht\@tempboxa\z@ \dp\@tempboxa\z@
553 <latexrelease> \put{-\ovdx}{-\ovdy}{\box\@tempboxa}%
554 <latexrelease> \endgroup}
555 <latexrelease>\EndIncludeInRelease
556 (*2ekernel)

```

(End definition for \oval.)

\@ovvert

```

557 </2ekernel>
558 <latexrelease>\IncludeInRelease{2016/03/31}%
559 <latexrelease> \ovvert{Avoid almost zero length leaders}%
560 (*2ekernel|latexrelease)
561 \def\@ovvert#1#2{\vbox to\ovyy{%
562 \if@ovb \@tempcntb \@tempcnta \advance \@tempcntb #1\relax
563 \kern -\ovro \hbox{\char \@tempcntb}\nointerlineskip
564 \else \kern \ovri \kern \ovdy \fi
565 \if@ovvline \leaders\vrule \@width \@wholewidth \fi
566 \vfil \nointerlineskip
567 \if@ovt \@tempcntb \@tempcnta \advance \@tempcntb #2\relax
568 \hbox{\char \@tempcntb}%
569 \else \kern \ovdy \kern \ovro \fi}}
570 </2ekernel|latexrelease>
571 <latexrelease>\EndIncludeInRelease
572 <latexrelease>\IncludeInRelease{0000/00/00}%
573 <latexrelease> \ovvert{Avoid almost zero length leaders}%
574 <latexrelease>\def\@ovvert#1#2{\vbox to\ovyy{%
575 <latexrelease> \if@ovb \@tempcntb \@tempcnta \advance \@tempcntb #1\relax
576 <latexrelease> \kern -\ovro \hbox{\char \@tempcntb}\nointerlineskip
577 <latexrelease> \else \kern \ovri \kern \ovdy \fi
578 <latexrelease> \leaders\vrule \@width \@wholewidth\vfil \nointerlineskip
579 <latexrelease> \if@ovt \@tempcntb \@tempcnta \advance \@tempcntb #2\relax
580 <latexrelease> \hbox{\char \@tempcntb}%
581 <latexrelease> \else \kern \ovdy \kern \ovro \fi}}
582 <latexrelease>\EndIncludeInRelease
583 (*2ekernel)

```

(End definition for \@ovvert.)

\@ovhorz

```

584 </2ekernel>
585 <latexrelease>\IncludeInRelease{2016/03/31}%
586 <latexrelease> \ovhorz{Avoid almost zero length leaders}%

```

```

587 <*2ekernel | latexrelease>
588 \def\@ovhorz{\hb@xt@\@ovxx{\kern \@ovro
589   \if@ovr \else \kern \@ovdx \fi

590   \if@ovhline \leaders \hrule \@height \@wholewidth \fi

591   \hfil
592   \if@ovl \else \kern \@ovdx \fi
593   \kern \@ovri}}
594 </2ekernel | latexrelease>

595 <latexrelease>\EndIncludeInRelease
596 <latexrelease>\IncludeInRelease{0000/00/00}%
597 <latexrelease>          {\@ovhorz}{Avoid almost zero length leaders}%
598 <latexrelease>\def\@ovhorz{\hb@xt@\@ovxx{\kern \@ovro
599 <latexrelease>   \if@ovr \else \kern \@ovdx \fi
600 <latexrelease>   \leaders \hrule \@height \@wholewidth \hfil
601 <latexrelease>   \if@ovl \else \kern \@ovdx \fi
602 <latexrelease>   \kern \@ovri}}
603 <latexrelease>\EndIncludeInRelease
604 <*2ekernel>

```

(End definition for \@ovhorz.)

\circle

```

605 \def\circle{\@inmatherr\circle\@ifstar\@dot\@circle}

```

(End definition for \circle.)

\@circle

```

606 </2ekernel>
607 <*2ekernel | latexrelease>
608 <latexrelease>\IncludeInRelease{2020/10/01}%
609 <latexrelease>          {\@circle}{default units}%
610 \def\@circle#1{%
611   \begingroup \boxmaxdepth \maxdimen
612   \@defaultunitsset\@tempdimb{#1}\unitlength
613   \ifdim \@tempdimb >15.5\p@ \@getcirc\@tempdimb
614     \@ovro\ht\@tempboxa
615     \setbox\@tempboxa\hbox{\@circlefnt
616       \advance\@tempcnta\tw@ \char \@tempcnta
617       \advance\@tempcnta\m@ne \char \@tempcnta \kern -2\@tempdima
618       \advance\@tempcnta\tw@
619       \raise \@tempdima \hbox{\char\@tempcnta}\raise \@tempdima
620       \box\@tempboxa}\ht\@tempboxa\z@ \dp\@tempboxa\z@
621       \@put{-\@ovro}{-\@ovro}{\box\@tempboxa}%
622     \else \@circ\@tempdimb{96}\fi\endgroup}
623 </2ekernel | latexrelease>

624 <latexrelease>\EndIncludeInRelease
625 <latexrelease>\IncludeInRelease{0000/00/00}%
626 <latexrelease>          {\@circle}{default units}%
627 <latexrelease>\def\@circle#1{%
628 <latexrelease>   \begingroup \boxmaxdepth \maxdimen \@tempdimb #1\unitlength
629 <latexrelease>   \ifdim \@tempdimb >15.5\p@ \@getcirc\@tempdimb
630 <latexrelease>     \@ovro\ht\@tempboxa

```



```

631 <latexrelease> \setbox\@tempboxa\hbox{\@circlefnt
632 <latexrelease> \advance\@tempcnta\tw@ \char \@tempcnta
633 <latexrelease> \advance\@tempcnta\m@ne \char \@tempcnta
634 <latexrelease> \kern -2\@tempdima
635 <latexrelease> \advance\@tempcnta\tw@
636 <latexrelease> \raise \@tempdima \hbox{\char\@tempcnta}%
637 <latexrelease> \raise \@tempdima
638 <latexrelease> \box\@tempboxa\ht\@tempboxa\z@ \dp\@tempboxa\z@
639 <latexrelease> \put{-\@ovro}{-\@ovro}{\box\@tempboxa}%
640 <latexrelease> \else \@circ\@tempdimb{96}\fi\endgroup}
641 <latexrelease>\EndIncludeInRelease
642 <*2ekernel>

```

(End definition for \@circle.)

\@dot Internal form of \circle\*.

```

643 </2ekernel>
644 <*2ekernel | latexrelease>
645 <latexrelease>\IncludeInRelease{2020/10/01}%
646 <latexrelease> {\@dot}{default units}%
647 \def\@dot#1{%
648 \@defaultunitsset\@tempdimb{#1}\unitlength
649 \@circ\@tempdimb{112}}
650 </2ekernel | latexrelease>
651 <latexrelease>\EndIncludeInRelease
652 <latexrelease>\IncludeInRelease{0000/00/00}%
653 <latexrelease> {\@dot}{default units}%
654 <latexrelease>\def\@dot#1{\@tempdimb #1\unitlength \@circ\@tempdimb{112}}
655 <latexrelease>\EndIncludeInRelease
656 <*2ekernel>

```

(End definition for \@dot.)

\@circ

```

657 \def\@circ#1#2{\@tempdima #1\relax \advance\@tempdima .5\p@
658 \@tempcnta\@tempdima \@tempdima \p@
659 \divide\@tempcnta\@tempdima
660 \ifnum\@tempcnta >15\relax \@tempcnta 15\relax \fi
661 \ifnum \@tempcnta >\z@ \advance\@tempcnta\m@ne\fi
662 \advance\@tempcnta #2\relax
663 \@circlefnt \char\@tempcnta}

```

(End definition for \@circ.)

\@xarg Counters used for manipulating the ‘slope’ arguments.

```

\@yarg 664 \newcount\@xarg
\@yyarg 665 \newcount\@yarg
        666 \newcount\@yyarg

```

(End definition for \@xarg, \@yarg, and \@yyarg.)

\@multicnt Counter used in \multitup, and also \multicolumn.

```

667 \newcount\@multicnt

```

(End definition for \@multicnt.)

```

\@xdim Length registers.
\@ydim 668 \newdimen\@xdim
        669 \newdimen\@ydim

(End definition for \@xdim and \@ydim.)

\@linechar Box for holding a line segment character, for sloping lines.
        670 \newbox\@linechar

(End definition for \@linechar.)

\@linelen Length of the line currently being built.
        671 \newdimen\@linelen

(End definition for \@linelen.)

\@clnwd Height and width of current line segment.
\@clnht 672 \newdimen\@clnwd
        673 \newdimen\@clnht

(End definition for \@clnwd and \@clnht.)

\@dashdim \dashbox internal registers.
\@dashbox 674 \newdimen\@dashdim
\@dashcnt 675 \newbox\@dashbox
        676 \newcount\@dashcnt

(End definition for \@dashdim, \@dashbox, and \@dashcnt.)
Initialization: "\thinlines"
        677 \let\@linefnt\tenln
        678 \let\@circlefnt\tencirc
        679 \@wholewidth\fontdimen8\tenln
        680 \@halfwidth .5\@wholewidth

```

## 1.1 Curves

The new `\qbezier` command, based on the old `\bezier` defined in `bezier.sty`.  
*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

```

\qbezier[N] == \bezier{N}

\bezier{N}(AX,AY)(BX,BY)(CX,CY) ==
BEGIN
  IF N = 0
  THEN \@xdima := |BX - AX|
      \@xb := |CX - BX|
      \@xa := Max(\@xa, \@xb)
      \@ya := |BY - AY|
      \@yb := |CY - BY|
      \@ya := Max(\@ya, \@yb)
      @sc := Max(\@xa, \@ya)
      %% The coefficient .5 below is the degree of overlap of
      %% successive points, where 1 is no overlap and 0 is

```

```

%% complete overlap. A coefficient of C multiplies
%% the number of points plotted by 1/C.
%%
\@xa := .5 * \@halfwidth
@sc := @sc / \@halfwidth
@sc := Max(@sc, qbeziermax)
ELSE @sc := N
@scp := @sc+1
\@xb := 2 * (BX - AX) * \unitlength
\@xa := ((CX-AX)*\unitlength - \@xb)/@sc
\@yb := 2 * (BY - AY) * \unitlength
\@ya := ((CY-AY)*\unitlength - \@yb)/@sc
\@pictdot := square rule of width \@wholewidth
\count@ := 0
WHILE \count@ < @scp
DO \@xdim := ((\count@*\@xa + @xb) / @sc) * \count@
\@ydim := ((\count@*\@ya + @yb) / @sc) * \count@
plot pt with relative coords (\@xdim,\@ydim)
\count@ := \count@+1
OD

```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

**\qbeziermax** The maximum number of points to plot.

```
681 \def\qbeziermax{500}
```

*(End definition for \qbeziermax.)*

In the code below, to save registers \@a ... are not used. Instead other registers are reused.

```

\newcounter{@sc} -> \c@multicnt
\newcounter{@scp} -> \@tempcnta
\newdimen\@xa -> \@ovxx
\newdimen\@xb -> \@ovdx
\newdimen\@ya -> \@ovyy
\newdimen\@yb -> \@ovdy
\newsavebox{\@pictdot} -> \@tempboxa

```

**\qbezier** Main user-level command to plot quadratic bezier curves. #2 should be (.

```
682 \newcommand\qbezier[2][0]{\bezier{#1}#2}
```

*(End definition for \qbezier.)*

**\bezier** Form of \bezier compatible with 2.09 bezier.sty, but modified to ignore spaces between its arguments. #2 should be white space, and #4 should be (.

```
683 \def\bezier#1)#2(#3)#4({\@bezier#1)(#3){}
```

```

\@bezier 684 </2ekernel>
685 <*2ekernel | latexrelease>
686 <latexrelease>\IncludeInRelease{2020/10/01}%
687 <latexrelease>          {\@bezier}{default units}%
688 \def\@bezier#1(#2,#3)(#4,#5)(#6,#7){%
689   \ifnum #1=\z@
690     \@defaultunitsset\@ovxx{#4}\unitlength
691     \@defaultunitsset{\advance\@ovxx}{-#2}\unitlength
692     \ifdim \@ovxx<\z@ \@ovxx -\@ovxx \fi
693     \@defaultunitsset\@ovdx{#6}\unitlength
694     \@defaultunitsset{\advance\@ovdx}{-#4}\unitlength
695     \ifdim \@ovdx<\z@ \@ovdx -\@ovdx \fi
696     \ifdim \@ovxx<\@ovdx \@ovxx \@ovdx \fi
697     \@defaultunitsset\@ovyy{#5}\unitlength
698     \@defaultunitsset{\advance\@ovyy}{-#3}\unitlength
699     \ifdim \@ovyy<\z@ \@ovyy -\@ovyy \fi
700     \@defaultunitsset\@ovdy{#7}\unitlength
701     \@defaultunitsset{\advance\@ovdy}{-#5}\unitlength
702     \ifdim \@ovdy<\z@ \@ovdy -\@ovdy \fi
703     \ifdim \@ovyy<\@ovdy \@ovyy \@ovdy \fi
704     \@multicnt
705     \ifdim \@ovxx>\@ovyy \@ovxx \else \@ovyy \fi
706     \@ovxx .5\@halfwidth \divide\@multicnt\@ovxx
707     \ifnum \qbeziermax<\@multicnt
708       \@multicnt\qbeziermax\relax
709     \fi
710   \else \@multicnt#1\relax \fi
711   \@tempcnta\@multicnt \advance\@tempcnta\@ne
712   \@defaultunitsset\@ovdx{#4}\unitlength
713   \@defaultunitsset{\advance\@ovdx}{-#2}\unitlength
714   \multiply\@ovdx \tw@
715   \@defaultunitsset\@ovxx{#6}\unitlength
716   \@defaultunitsset{\advance\@ovxx}{-#2}\unitlength
717   \advance\@ovxx -\@ovdx \divide\@ovxx\@multicnt
718   \@defaultunitsset\@ovdy{#5}\unitlength
719   \@defaultunitsset{\advance\@ovdy}{-#3}\unitlength
720   \multiply\@ovdy \tw@
721   \@defaultunitsset\@ovyy{#7}\unitlength
722   \@defaultunitsset{\advance\@ovyy}{-#3}\unitlength
723   \advance\@ovyy -\@ovdy \divide\@ovyy\@multicnt

724   \setbox\@tempboxa\hbox{%
725     \hskip -\@halfwidth
726     \vrule \@height\@halfwidth
727     \@depth \@halfwidth
728     \@width \@wholewidth}%
729   \put(#2,#3){%
730     \count@\z@
731     \@whilenum{\count@<\@tempcnta}\do
732       {\@xdim\count@\@ovxx
733        \advance\@xdim\@ovdx
734        \divide\@xdim\@multicnt
735        \multiply\@xdim\count@

```

```

736         \@ydim\count@\@ovyy
737         \advance\@ydim\@ovdy
738         \divide\@ydim\@multicnt
739         \multiply\@ydim\count@
740         \raise \@ydim
741         \hb@xt@\z@{\kern\@xdim
742             \unhcopy\@tempboxa\hss}%
743         \advance\count@\@ne}}
744 \endkernel | latexrelease)

745 \latexrelease\EndIncludeInRelease
746 \latexrelease\IncludeInRelease{0000/00/00}%
747 \latexrelease{\@bezier}{default units}%
748 \latexrelease\def\@bezier#1(#2,#3)(#4,#5)(#6,#7){%
749 \latexrelease\ifnum #1=\z@
750 \latexrelease\@ovxx #4\unitlength
751 \latexrelease\advance\@ovxx -#2\unitlength
752 \latexrelease\ifdim \@ovxx<\z@ \@ovxx -\@ovxx \fi
753 \latexrelease\@ovdx #6\unitlength
754 \latexrelease\advance\@ovdx -#4\unitlength
755 \latexrelease\ifdim \@ovdx<\z@ \@ovdx -\@ovdx \fi
756 \latexrelease\ifdim \@ovxx<\@ovdx \@ovxx \@ovdx \fi
757 \latexrelease\@ovyy #5\unitlength
758 \latexrelease\advance\@ovyy -#3\unitlength
759 \latexrelease\ifdim \@ovyy<\z@ \@ovyy -\@ovyy \fi
760 \latexrelease\@ovdy #7\unitlength
761 \latexrelease\advance\@ovdy -#5\unitlength
762 \latexrelease\ifdim \@ovdy<\z@ \@ovdy -\@ovdy \fi
763 \latexrelease\ifdim \@ovyy<\@ovdy \@ovyy \@ovdy \fi
764 \latexrelease\@multicnt
765 \latexrelease\ifdim \@ovxx>\@ovyy \@ovxx \else \@ovyy \fi
766 \latexrelease\@ovxx .5\@halfwidth \divide\@multicnt\@ovxx
767 \latexrelease\ifnum
768 \latexrelease\qbeziermax<\@multicnt \@multicnt\qbeziermax\relax
769 \latexrelease\fi
770 \latexrelease\else \@multicnt#1\relax \fi
771 \latexrelease\@tempcnta\@multicnt \advance\@tempcnta\@ne
772 \latexrelease\@ovdx #4\unitlength \advance\@ovdx -#2\unitlength
773 \latexrelease\multiply\@ovdx \tw@
774 \latexrelease\@ovxx #6\unitlength \advance\@ovxx -#2\unitlength
775 \latexrelease\advance\@ovxx -\@ovdx \divide\@ovxx\@multicnt
776 \latexrelease\@ovdy #5\unitlength \advance\@ovdy -#3\unitlength
777 \latexrelease\multiply\@ovdy \tw@
778 \latexrelease\@ovyy #7\unitlength \advance\@ovyy -#3\unitlength
779 \latexrelease\advance\@ovyy -\@ovdy \divide\@ovyy\@multicnt
780 \latexrelease\setbox\@tempboxa\hbox{%
781 \latexrelease\hspace -\@halfwidth
782 \latexrelease\vrule \@height\@halfwidth
783 \latexrelease\@depth \@halfwidth
784 \latexrelease\@width \@wholewidth}%
785 \latexrelease\put(#2,#3){%
786 \latexrelease\count@\z@
787 \latexrelease\@whilenum{\count@<\@tempcnta}\do
788 \latexrelease{\@xdim\count@\@ovxx
789 \latexrelease\advance\@xdim\@ovdx

```

```

790 <latexrelease>          \divide\@xdim\@multicnt
791 <latexrelease>          \multiply\@xdim\count@
792 <latexrelease>          \@ydim\count@\@ovvy
793 <latexrelease>          \advance\@ydim\@ovdy
794 <latexrelease>          \divide\@ydim\@multicnt
795 <latexrelease>          \multiply\@ydim\count@
796 <latexrelease>          \raise \@ydim
797 <latexrelease>          \hb@xt@\z@{\kern\@xdim
798 <latexrelease>          \unhcopy\@tempboxa\hss}%
799 <latexrelease>          \advance\count@\@one}}
800 <latexrelease>\EndIncludeInRelease
801 <*2ekernel>

```

(End definition for \bezier and \@bezier.)

As the commands above all use “picture” interface we couldn’t define them with \DeclareRobustCommand so we do that now.

```

802 </2ekernel>
803 <*2ekernel | latexrelease>
804 <latexrelease>\IncludeInRelease{2019/10/01}%
805 <latexrelease>          {\bezier}{Make commands robust}%
806 \MakeRobust\bezier
807 \MakeRobust\circle
808 \MakeRobust\dashbox
809 \MakeRobust\line
810 \MakeRobust\linethickness
811 \MakeRobust\multiput
812 \MakeRobust\oval
813 \MakeRobust\put
814 \MakeRobust\qbezier
815 \MakeRobust\shortstack
816 \MakeRobust\thinline
817 \MakeRobust\vector
818 </2ekernel | latexrelease>
819 <latexrelease>\EndIncludeInRelease
820 <latexrelease>\IncludeInRelease{0000/00/00}%
821 <latexrelease>          {\bezier}{Make commands robust}%
822 <latexrelease>
823 <latexrelease>\kernel@make@fragile\bezier
824 <latexrelease>\kernel@make@fragile\circle
825 <latexrelease>\kernel@make@fragile\dashbox
826 <latexrelease>\kernel@make@fragile\line
827 <latexrelease>\kernel@make@fragile\linethickness
828 <latexrelease>\kernel@make@fragile\multiput
829 <latexrelease>\kernel@make@fragile\oval
830 <latexrelease>\kernel@make@fragile\put
831 <latexrelease>\kernel@make@fragile\qbezier
832 <latexrelease>\kernel@make@fragile\shortstack
833 <latexrelease>\kernel@make@fragile\thinline
834 <latexrelease>\kernel@make@fragile\vector
835 <latexrelease>
836 <latexrelease>\EndIncludeInRelease
837 <*2ekernel>
838 </2ekernel>

```

## File N

# ltthm.dtx

## 1 Theorem Environments

The user creates his own theorem-like environments with the command

`\newtheorem{<name>}{<text>}[<counter>]` or

`\newtheorem{<name>}[<oldname>]{<text>}`

This defines the environment `<name>` to be just as one would expect a theorem environment to be, except that it prints `<text>` instead of “Theorem”.

If `<oldname>` is given, then environments `<name>` and `<oldname>` use the same counter, so using a `<name>` environment advances the number of the next `<name>` environment, and vice-versa.

If `<counter>` is given, then environment `<name>` is numbered within `<counter>`.

E.g., if `<counter> = subsection`, then the first `<name>` in subsection 7.2 is numbered `<text>` 7.2.1.

The way `<name>` environments are numbered can be changed by redefining `\the<name>`.  
*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

### DOCUMENT STYLE PARAMETERS

`\@thmcounter{COUNTER}` : A command such that

`\edef\theCOUNTER{\@thmcounter{COUNTER}}`

defines `\theCOUNTER` to produce a number for a theorem environment.

The default is:

`BEGIN \noexpand\arabic{COUNTER} END`

`\@thmcountersep` : A separator placed between a theorem number and the number of the counter within which it is numbered.

E.g., to make the third theorem of section 7.2 be numbered 7.2-3, `\@thmcountersep` should be `\def`'ed to `'-'`. Its default is `''`.

`\@begintheorem{NAME}{NUMBER}` : A command that begins a theorem environment for a 'theorem' named 'NAME NUMBER' –

e.g., `\@begintheorem{Lemma}{3.7}` starts Lemma 3.7.

`\@opargbegintheorem{NAME}{NUMBER}{OPARG}` :

A command that begins a theorem environment for a 'theorem' named 'NAME NUMBER' with optional argument OPARG – e.g., `\@begintheorem{Lemma}{3.7}{Jones}` starts 'Lemma 3.7 (Jones)':.

`\@endtheorem` : A command that ends a theorem environment.

`\newtheorem{NAME}{TEXT}[COUNTER] ==`

`BEGIN`

if `\NAME` is definable

```

then \@definecounter{NAME}
  if COUNTER present
    then \@newctr{NAME}[COUNTER] fi
    \theNAME == BEGIN \theCOUNTER \@thmcountersep
                                eval\@thmcounter{NAME} END
    else \theNAME == BEGIN eval\@thmcounter{NAME} END
    \NAME == \@thm{NAME}{TEXT}
    \endNAME == \@endtheorem
  else error
fi
END

\newtheorem{NAME}[OLDNAME]{TEXT}==
BEGIN
  if counter OLDNAME nonexistent
  then ERROR
  else
    if \NAME is definable
    then BEGIN
      \theNAME == \theOLDNAME
      \NAME == \@thm{OLDNAME}{TEXT}
      \endNAME == \@endtheorem
      END
    else error
    fi
  fi
END

\@thm{NAME}{TEXT} ==
BEGIN
  \refstepcounter{NAME}
  if next char = [
    then \@ythm{NAME}{TEXT}
    else \@xthm{NAME}{TEXT}
  fi
END

\@xthm{NAME}{TEXT} ==
BEGIN
  \@begintheorem{TEXT}{\theNAME}
  \ignorespaces
END

\@ythm{NAME}{TEXT}[OPARG] ==
BEGIN
  \@opargbegintheorem{TEXT}{\theNAME}{OPARG}
  \ignorespaces
END

```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*



`\newtheorem` `\newtheorem` ought really be allowed only in the preamble Which would be good document style, and allow some main memory to be saved by declaring these commands to be `\@onlypreamble`. Unfortunately the L<sup>A</sup>T<sub>E</sub>X book indicates that `\newtheorem` may be used anywhere in the document...

```

1 <*2ekernel>
2 \def\newtheorem#1{%
3   \ifnextchar[{\@othm{#1}}{\@nthm{#1}}}
```

(End definition for `\newtheorem`.)

`\@nthm`

```

4 \def\@nthm#1#2{%
5   \ifnextchar[{\@xnthm{#1}{#2}}{\@ynthm{#1}{#2}}}
```

(End definition for `\@nthm`.)

`\@xnthm` 92/09/18 RmS: Changed `\@addtoreset` to `\@newctr` to produce error message if counter #3 does not exist (to be consistent with behaviour of `\newcounter`)

```

6 \def\@xnthm#1#2[#3]{%
7   \expandafter\@ifdefinable\csname #1\endcsname
8     {\@definecounter{#1}\@newctr{#1}[#3]%
9     \expandafter\xdef\csname the#1\endcsname{%
10      \expandafter\noexpand\csname the#3\endcsname \@thmcountersep
11      \@thmcounter{#1}}}%
12   \global\@namedef{#1}{\@thm{#1}{#2}}%
13   \global\@namedef{end#1}{\@endtheorem}}}
```

(End definition for `\@xnthm`.)

`\@ynthm`

```

14 \def\@ynthm#1#2{%
15   \expandafter\@ifdefinable\csname #1\endcsname
16     {\@definecounter{#1}%
17     \expandafter\xdef\csname the#1\endcsname{\@thmcounter{#1}}%
18     \global\@namedef{#1}{\@thm{#1}{#2}}%
19     \global\@namedef{end#1}{\@endtheorem}}}
```

(End definition for `\@ynthm`.)

`\@othm`

```

20 \def\@othm#1[#2]#3{%
21   \@ifundefined{c@#2}{\@nocounterr{#2}}%
22   {\expandafter\@ifdefinable\csname #1\endcsname
23     {\global\@namedef{the#1}{\@nameuse{the#2}}%
24     \global\@namedef{#1}{\@thm{#2}{#3}}%
25     \global\@namedef{end#1}{\@endtheorem}}}
```

(End definition for `\@othm`.)

`\@thm`

```

26 \def\@thm#1#2{%
27   \refstepcounter{#1}%
28   \@ifnextchar[{\@ythm{#1}{#2}}{\@xthm{#1}{#2}}}
```

(End definition for `\@thm`.)

```

\@xthm
\@ythm
29 \def\@xthm#1#2{%
30   \@begintheorem{#2}{\csname the#1\endcsname}\ignorespaces}
31 \def\@ythm#1#2[#3]{%
32   \@opargbegintheorem{#2}{\csname the#1\endcsname}{#3}\ignorespaces}

(End definition for \@xthm and \@ythm.)
Default values

\@thmcounter
\@thmcountersep
33 \def\@thmcounter#1{\noexpand\arabic{#1}}
34 \def\@thmcountersep{.}

(End definition for \@thmcounter and \@thmcountersep.)

\@begintheorem Providing theorem defaults.
\@opargbegintheorem
\@endtheorem
35 \def\@begintheorem#1#2{\trivlist
36   \item[\hskip \labelsep{\bfseries #1\ #2}]\itshape}
37 \def\@opargbegintheorem#1#2#3{\trivlist
38   \item[\hskip \labelsep{\bfseries #1\ #2\ (#3)}]\itshape}
39 \def\@endtheorem{\endtrivlist}
40 \endkernel

(End definition for \@begintheorem, \@opargbegintheorem, and \@endtheorem.)

```

# File O

## ltsect.dtx

### 1 Sectioning Commands

This file defines the declarations such as `\author` which are used by `\maketitle`. `\maketitle` itself is defined by each class, not in the L<sup>A</sup>T<sub>E</sub>X kernel.

The second part of the file defines the generic commands used for defining sectioning commands such as `\chapter`. Again the actual document level commands are defined in the class files, in terms of these commands.

```
1 <*2ekernel>
2 \message{title,}
```

#### 1.1 The Title

`\title` The user defines the title and author by the declarations `\title{<name>}`, `\author{<name>}`  
`\author` Similarly the date is declared with `\date{<date>}`.  
`\date` Inside these, the `\thanks{<footnote text>}` command may be used to make acknowl-  
`\thanks` edgements, notice of address, etc. in a footnote. If there are multiple authors, they have  
`\and` to be separated with the `\and` command.  
`\maketitle` And finally, the `\maketitle` command produces the actual title, using the informa-  
tion previously saved with the other commands.

```
3 </2ekernel>
4 <*2ekernel | latexrelease>
5 <latexrelease>\IncludeInRelease{2019/10/01}%
6 <latexrelease>                                {\title}{Make commands robust}%
```

`\title` `\title` for use in `\maketitle`. If not given `\maketitle` will produce an error message.

```
7 \DeclareRobustCommand\title[1]{\gdef\@title{#1}}
```

*(End definition for \title.)*

`\author` `\author` for use in `\maketitle`. If not given `\maketitle` will produce a warning message.

```
8 \DeclareRobustCommand*\author[1]{\gdef\@author{#1}}
```

*(End definition for \author.)*

`\date` `\date` for use in `\maketitle`. If not given `\maketitle` will produce `\today` as the default.

```
9 \DeclareRobustCommand*\date[1]{\gdef\@date{#1}}
```

*(End definition for \date.)*

`\thanks`

```
10 \DeclareRobustCommand\thanks[1]{\footnotemark
11     \protected@xdef\@thanks{\@thanks
12         \protect\footnotetext[\the\c@footnote]{#1}}%
13 }
```

*(End definition for \thanks.)*

`\and`

```
14 \DeclareRobustCommand\and{%    % \begin{tabular}
15   \end{tabular}}%
16   \hskip 1em \@plus.17fil%
17   \begin{tabular}[t]{c}}%    % \end{tabular}
```

*(End definition for \and.)*

```
18 </2ekernel | latexrelease>
19 <latexrelease>\EndIncludeInRelease
20 <latexrelease>\IncludeInRelease{0000/00/00}%
21 <latexrelease>                {\title}{Make commands robust}%
22 <latexrelease>
23 <latexrelease>\kernel@make@fragile\title
24 <latexrelease>\kernel@make@fragile\author
25 <latexrelease>\kernel@make@fragile\date
26 <latexrelease>\kernel@make@fragile\thanks
27 <latexrelease>\kernel@make@fragile\and
28 <latexrelease>
29 <latexrelease>\EndIncludeInRelease
30 <*2ekernel>
```

`\@title`

```
31 \def\@title{\@latex@error{No \noexpand\title given}\@ehc}
```

*(End definition for \@title.)*

`\@author`

```
32 \def\@author{\@latex@warning@no@line{No \noexpand\author given}}
```

*(End definition for \@author.)*

`\@date`

```
33 \gdef\@date{\today}
```

*(End definition for \@date.)*

`\@thanks`

```
34 \let\@thanks\@empty
```

*(End definition for \@thanks.)*

```
35 \message{sectioning,}
```

## 1.2 Sectioning

`\@secpenalty`

```
36 \newcount\@secpenalty
37 \@secpenalty = -300
```

*(End definition for \@secpenalty.)*

`\if@noskipsec` Way back in 1991 (08/26) FMi & RmS set the `\@noskipsec` switch to true for the  
`\@noskipsectrue` preamble and to false in `\document`. This was done to trap lists and related text in the  
preamble but it does not catch everything.

```
38 \newif\if@noskipsec \@noskipsectrue
```

(End definition for \if@noskipsec and \@noskipsectrue.)

**\@startsection** The `\@startsection{<name>}{<level>}{<indent>}{<before skip>}{<after skip>}{<style>}`\*[`<altheading> <heading>`] command is the mother of all the user level sectioning commands. The part after the \*, including the \* is optional.

**name:** e.g., 'subsection'

**level:** a number, denoting depth of section – e.g., chapter = 0, section = 1, etc.

**indent:** Indentation of heading from left margin

**before skip:** Absolute value = skip to leave above the heading. If negative, then paragraph indent of text following heading is suppressed.

**after skip:** if positive, then skip to leave below heading, else negative of skip to leave to right of run-in heading.

**style:** Commands to set style. Since June 1996 release the *last* command in this argument may be a command such as `\MakeUppercase` or `\fbox` that takes an argument. The section heading will be supplied as the argument to this command. So setting #6 to, say, `\bfseries\MakeUppercase` would produce bold, uppercase headings.

If '\*' is missing, then increment the counter. If it is present, then there should be no [`<altheading>`] argument. The command uses the counter 'secnumdepth'. It contains a pointer to the highest section level that is to be numbered.

**Warning:** The `\@startsection` command should be at the same or higher grouping level as the text that follows it. For example, you should *not* do something like

```
\def\foo{ \begingroup ...
           \paragraph{...}
           \endgroup}
```

Pseudocode for the `\@startsection` command *Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments* (not necessarily accurate any more):

```
\@startsection
{NAME}{LEVEL}{INDENT}{BEFORESKIP}{AFTERSKIP}{STYLE} ==
BEGIN
  IF @noskipsec = T THEN \leavevmode FI
                                % true if previous section had no body.

  \par
  \@tempskipa := BEFORESKIP
  @afterindent := T
  IF \@tempskipa < 0 THEN \@tempskipa := -\@tempskipa
                                @afterindent := F
  FI
  IF @nobreak = true
    THEN \everypar == null
    ELSE \addpenalty{\@secpenalty}
          \addvspace{\@tempskipa}
  FI
  IF * next
```

```

        THEN \@ssect{INDENT}{BEFORESKIP}{AFTERSKIP}{STYLE}
        ELSE \@dblarg{\@sect
                    {NAME}{LEVEL}{INDENT}
                    {BEFORESKIP}{AFTERSKIP}{STYLE}}
    FI
END
End of historical LATEX 2.09 comments.

```

```

39 \def\@startsection#1#2#3#4#5#6{%
40   \if@noskipsec \leavevmode \fi
41   \par
42   \@tempskipa #4\relax
43   \@afterindenttrue
44   \ifdim \@tempskipa <\z@
45     \@tempskipa -\@tempskipa \@afterindentfalse
46   \fi
47   \if@nobreak
48     \everypar{}%
49   \else
50     \addpenalty\@secpenalty\addvspace\@tempskipa
51   \fi
52   \@ifstar
53     {\@ssect{#3}{#4}{#5}{#6}}%
54     {\@dblarg{\@sect{#1}{#2}{#3}{#4}{#5}{#6}}}

```

*(End definition for \@startsection.)*

**\@sect** Pseudocode for the \@sect command *Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

```

\@sect{NAME}{LEVEL}
      {INDENT}{BEFORESKIP}{AFTERSKIP}
      {STYLE}[ARG1]{ARG2}
      ==
BEGIN
  IF LEVEL > \@secnumdepth
    THEN \@svsec :=L null
    ELSE \refstepcounter{NAME}
          \@svsec :=L BEGIN \@seccntformat{#1}\relax END
  FI
  IF AFTERSKIP > 0
    THEN \begingroup
          STYLE
          \@hangfrom{\hskip INDENT\@svsec}
          {\interlinepenalty 10000 ARG2\par}
        \endgroup
        \NAMEmark{ARG1}
        \addcontentsline{toc}{NAME}
        { IF LEVEL > \@secnumdepth
          ELSE \protect\numberline{\theNAME} FI
          ARG1 }
    ELSE \@svsechd == BEGIN STYLE
                                \hskip INDENT\@svsec

```

```

ARG2
\NAMEmark{ARG1}
\addcontentsline{toc}{NAME}
{ IF LEVEL > \c@secnumdepth
ELSE
\protect\numberline{\theNAME}
FI
ARG1 }

END

FI
\@xsect{AFTERSKIP}
END
End of historical LATEX 2.09 comments.

55 \def\@sect#1#2#3#4#5#6[#7]#8{%
56 \ifnum #2>\c@secnumdepth
57 \let\@svsec\@empty
58 \else
59 \refstepcounter{#1}%

Since \@secntformat might end with an improper \hskip which is scanning forward
for plus or minus we end the definition of \@svsec with \relax as a precaution.

60 \protected@edef\@svsec{\@secntformat{#1}\relax}%
61 \fi
62 \@tempskipa #5\relax
63 \ifdim \@tempskipa>\z@
64 \begingroup

This { used to be after the argument to \@hangfrom but was moved here to allow com-
mands such as \MakeUppercase to be used at the end of #6.

65 #6{%
66 \@hangfrom{\hskip #3\relax\@svsec}%
67 \interlinepenalty \@M #8\@par}%
68 \endgroup
69 \csname #1mark\endcsname{#7}%
70 \addcontentsline{toc}{#1}{%
71 \ifnum #2>\c@secnumdepth \else
72 \protect\numberline{\csname the#1\endcsname}%
73 \fi
74 #7}%
75 \else

\relax added 2 May 90

76 \def\@svsechd{%
77 #6{\hskip #3\relax
78 \@svsec #8}%
79 \csname #1mark\endcsname{#7}%
80 \addcontentsline{toc}{#1}{%
81 \ifnum #2>\c@secnumdepth \else
82 \protect\numberline{\csname the#1\endcsname}%
83 \fi
84 #7}}%
85 \fi
86 \@xsect{#5}}

```

(End definition for \@sect.)

`\@xsect` Pseudocode for the `\@xsect` command *Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

```
\@xsect{AFTERSKIP} ==
BEGIN
  IF AFTERSKIP > 0
    THEN \par \nobreak
         \vskip AFTERSKIP
         \@afterheading
    ELSE @nobreak :=G F
         @noskipsec :=G T
         \everypar{ IF @noskipsec = T
                     THEN @noskipsec :=G F
                         \clubpenalty := 10000 % local
                         \hskip -\parindent
                         \begingroup
                           \@svsechd
                         \endgroup
                         \unskip
                         \hskip -AFTERSKIP \relax
                                     %% relax added 14 Jan 91
                     ELSE \clubpenalty := \@clubpenalty % local
                         \everypar := NULL
                     FI
                   }
         FI
  FI
END
```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

```
87 \def\@xsect#1{%
88   \@tempskipa #1\relax
89   \ifdim \@tempskipa>\z@
```

Why not combine `\@sect` and `\@xsect` and save doing the same test twice? It is not possible to change this now as these have become hooks!

This `\par` seems unnecessary.

```
90   \par \nobreak
91   \vskip \@tempskipa
92   \@afterheading
93 \else
94   \@nobreakfalse
95   \global\@noskipsectrue
96   \everypar{%
97     \if@noskipsec
98       \global\@noskipsecfalse
99       {\setbox\z@\lastbox}%
100       \clubpenalty\@M
101       \begingroup \@svsechd \endgroup
102       \unskip
103       \@tempskipa #1\relax
```



```

104      \hskip -\@tempskipa
105    \else
106      \clubpenalty \@clubpenalty
107      \everypar{}\%
108    \fi}%
109  \fi
110  \ignorespaces}

```

(End definition for \xsect.)

**\@secntformat** This command formats the section number including the space following it.

```

111 \def\@secntformat#1{\csname the#1\endcsname\quad}

```

(End definition for \@secntformat.)

Pseudocode for the \ssect command *Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more)*:

```

\ssect{INDENT}{BEFORESKIP}{AFTERSKIP}{STYLE}{ARG} ==
BEGIN
  IF AFTERSKIP > 0
    THEN \begingroup
          STYLE
          \@hangfrom{\hskip INDENT}
                {\interlinepenalty 10000 ARG\par}
        \endgroup
    ELSE \@svsechd == BEGIN STYLE
                        \hskip INDENT
                        ARG
                      END
  FI
  \xsect{AFTERSKIP}
END

```

End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.

Pseudocode for the \@afterheading command *Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more)*:

```

\@afterheading ==
BEGIN
  @nobreak :=G true
  \everypar := BEGIN IF @nobreak = T
                  THEN @nobreak :=G false
                      \clubpenalty := 10000 % local
                      IF @afterindent = F
                        THEN remove \lastbox
                      FI
                  ELSE \clubpenalty := \@clubpenalty % local
                      \everypar := NULL
                  FI
  END
END

```

END

End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.

`\@ssect`

```
112 \def\@ssect#1#2#3#4#5{%
113   \@tempkipa #3\relax
114   \ifdim \@tempkipa>\z@
115     \begingroup
This { used to be after the argument to \@hangfrom but was moved here to allow com-
mands such as \MakeUppercase to be used at the end of #4.
116     #4{%
117       \@hangfrom{\hskip #1}%
118       \interlinepenalty \@M #5\@@par}%
119     \endgroup
120   \else
121     \def\@svsechd{#4{\hskip #1\relax #5}}%
122   \fi
123   \@xsect{#3}}
```

*(End definition for \@ssect.)*

`\if@afterindent`

`\@afterindenttrue` 124 `\newif\if@afterindent \@afterindenttrue`

*(End definition for \if@afterindent and \@afterindenttrue.)*

`\@afterheading` This hook is used in setting up custom-built headings in classes.dtx.

```
125 \def\@afterheading{%
126   \@nbreaktrue
127   \everypar{%
128     \if@nbreak
129       \@nbreakfalse
130       \clubpenalty \@M
131       \if@afterindent \else
132         {\setbox\z@\lastbox}%
133       \fi
134     \else
135       \clubpenalty \@clubpenalty
136     \everypar{}%
137   \fi}}
```

*(End definition for \@afterheading.)*

`\@hangfrom` `\@hangfrom{<text>}` : Puts `<text>` in a box, and makes a hanging indentation of the following material up to the first `\par`. Should be used in vertical mode.

```
138 \def\@hangfrom#1{\setbox\@tempboxa\hbox{#1}}%
139   \hangindent \wd\@tempboxa\noindent\box\@tempboxa}
```

*(End definition for \@hangfrom.)*

`\c@secnumdepth`

`\c@tocdepth` 140 `\newcount\c@secnumdepth`  
141 `\newcount\c@tocdepth`

*(End definition for \c@secnumdepth and \c@tocdepth.)*

`\secdef` `\secdef{⟨unstarcmds⟩}{⟨unstarcmds⟩}{⟨starcmds⟩}`

When defining a `\chapter` or `\section` command without using `\@startsection`, you can use `\secdef` as follows:

1. `\def\chapter{... \secdef \⟨starcmd⟩ \⟨unstarcmd⟩ }`
2. `\def\⟨starcmd⟩[#1]#2{...} % Command to define \chapter[...]{...}`
3. `\def\⟨unstarcmd⟩#1{...} % Command to define \chapter*{...}`

142 `\def\secdef#1#2{\@ifstar{#2}{\@dblarg{#1}}}`

(End definition for `\secdef`.)

### 1.2.1 Initializations

```

\sectionmark
\subsectionmark
\subsubsectionmark
\paragraphmark
\subparagraphmark

```

143 `\let\sectionmark\@gobble`

144 `\let\subsectionmark\@gobble`

145 `\let\subsubsectionmark\@gobble`

146 `\let\paragraphmark\@gobble`

147 `\let\subparagraphmark\@gobble`

(End definition for `\sectionmark` and others.)

148 `\message{contents,}`

## 1.3 Table of Contents etc.

### 1.3.1 Convention

`\tf@⟨foo⟩` = file number for output for table foo. The file is opened only if `@files` = true.

### 1.3.2 Commands

A `\l@⟨type⟩{⟨entry⟩}{⟨page⟩}` Macro needs to be defined by document style for making an entry of type `⟨type⟩` in a table of contents, etc. E.g., the document style should define `\l@chapter`, `\l@section`, etc.

**Note:** When the `\protect` command is used in the `⟨entry⟩` or `⟨text⟩` of one of the commands below, it causes the following control sequence to be written on the file without being expanded. The sequence will be expanded when the table of contents entry is processed.

**Surprise:** Inside an `\addcontentsline` or `\addtocontents` command argument, the commands: `\index`, `\glossary`, and `\label` are no-ops. This could cause a problem if the user puts an `\index` or `\label` into one of the commands he writes, or into the optional ‘short version’ argument of a `\section` or `\caption` command.

`\@starttoc` The `\@starttoc{⟨ext⟩}` command is used to define the commands:

`\tableofcontents`, `\listoffigures`, etc.

For example: `\@starttoc{lof}` is used in `\listoffigures`. This command reads the `.⟨ext⟩` file and sets up to write the new `.⟨ext⟩` file.

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

`\@starttoc{EXT} ==`

```

BEGIN
  \begingroup
  \makeatletter
  read file \jobname.EXT
  IF @filesw = true
    THEN open \jobname.EXT as file \tf@EXT
  FI
  @nobreak :=G FALSE %% added 24 May 89
\endgroup
END

```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

```

149 \def\@starttoc#1{%
150   \begingroup
151   \makeatletter
152   \@input{\jobname.#1}%
153   \if@filesw
154     \expandafter\newwrite\csname tf@#1\endcsname
155     \immediate\openout \csname tf@#1\endcsname \jobname.#1\relax
156   \fi
157   \@nobreakfalse
158   \endgroup}

```

*(End definition for \@starttoc.)*

**\addcontentsline** The `\addcontentsline{<table>}{<type>}{<entry>}` command allows the user to add his/her own entry to a table of contents, etc. The command adds the entry `\contentsline{<type>}{<entry>}{<page>}{}` to the `.<table>` file.

This macro is implemented as an application of `\addtocontents`. Note that `\thepage` is not expandable during `\protected@write` therefore one gets the page number at the time of the `\shipout`.

```

159 </2ekernel>
160 <*2ekernel | latexrelease>
161 <latexrelease>\IncludeInRelease{2020/10/01}%
162 <latexrelease>          {\addcontentsline}{fourth argument}%
163 \def\addcontentsline#1#2#3{%

```

We add an empty brace pair at the end of `\contentsline` so that the number of argument is identical in documents with and without `hyperref`.

```

164   \addtocontents{#1}{\protect\contentsline{#2}{#3}{\thepage}{}}%
165   \protected@file@percent}%
166 </2ekernel | latexrelease>
167 <latexrelease>\EndIncludeInRelease
168 <latexrelease>\IncludeInRelease{2018/12/01}%
169 <latexrelease>          {\addcontentsline}{Mask line endings}%
170 <latexrelease> \def\addcontentsline#1#2#3{%
171 <latexrelease> \addtocontents{#1}{\protect\contentsline{#2}{#3}{\thepage}%

```

We add `\protected@file@percent` at the end which is turned inside `\@writefile` into a percent character to mask the newline after the closing argument brace.

```

172 <latexrelease>          \protected@file@percent}}
173 <latexrelease>\EndIncludeInRelease
174 <latexrelease>\IncludeInRelease{0000/00/00}%
175 <latexrelease>          {\addcontentsline}{Mask line endings}%

```

```

176 <latexrelease>\def\addcontentsline#1#2#3{%
177 <latexrelease> \addtocontents{#1}{\protect\contentsline{#2}{#3}{\thepage}}
178 <latexrelease>\EndIncludeInRelease
179 <*2ekernel>

```

(End definition for \addcontentsline.)

**\addtocontents** The `\addtocontents{<table>}{<text>}` command adds `<text>` to the `.<table>` file, with no page number.

```

180 \long\def\addtocontents#1#2{%
181   \protected@write\@auxout
182     {\let\label\@gobble \let\index\@gobble \let\glossary\@gobble}%
183     {\string\@writefile{#1}{#2}}}

```

(End definition for \addtocontents.)

**\contentsline** The `\contentsline{<type>}{<entry>}{<page>}{}` macro produces a `<type>` entry in a table of contents, etc. It will appear in the `.toc` or other file. For example, The entry for subsection 1.4.3 in the table of contents for example, might be produced by:

```

\contentsline{subsection}
  {\makebox{30pt}[r]{1.4.3} Gnats and Gnus}{22}

```

The `\protect` command causes command sequences to be written without expanding them.

```

184 </2ekernel>
185 <*2ekernel | latexrelease>
186 <latexrelease>\IncludeInRelease{2021/11/15}%
187 <latexrelease> \contentsline{Four arguments}%

```

In the `toc` file `\contentsline` is followed by 4 arguments these days, but only the first 3 are used in the old interface. The fourth was by default empty and only used when `hyperref` was loaded. We now pick up all 4 arguments, save the last one away in `\@contentsline@destination` and then call the old interface. This is done to simplify the interface to `hyperref` and to prepare for future changes.

```

188 \def\contentsline#1#2#3#4{\gdef\@contentsline@destination{#4}%
189   \csname l@#1\endcsname{#2}{#3}}

```

Default definition.

```

190 \let\@contentsline@destination\@empty
191 </2ekernel | latexrelease>
192 <latexrelease>\EndIncludeInRelease
193 <latexrelease>\IncludeInRelease{0000/00/00}%
194 <latexrelease> \contentsline{Four arguments}%
195 <latexrelease>
196 <latexrelease>\def\contentsline#1{\csname l@#1\endcsname}
197 <latexrelease>\let\@contentsline@destination\@undefined
198 <latexrelease>\EndIncludeInRelease
199 <*2ekernel>

```

(End definition for \contentsline.)

`\@dottedtocline{<level>}{<indent>}{<numwidth>}{<title>}{<page>}`: Macro to produce a table of contents line with the following parameters:

**level** If  $\langle level \rangle > \text{\c@tocdepth}$ , then no line produced.

**indent** Total indentation from the left margin.

**numwidth** Width of box for number if the  $\langle title \rangle$  has a `\numberline` command. As of 25 Jan 1988, this is also the amount of extra indentation added to second and later lines of a multiple line entry.

**title** Contents of entry.

**page** Page number.

Uses the following parameters, which must be set by the document style. They should be defined with `\def`'s.

**pnumwidth** Width of box in which page number is set.

**tocrmarg** Right margin indentation for all but last line of multiple-line entries.

**dotsep** Separation between dots, in mu units. Should be `\def`'d to a number like 2 or 1.7

`\@dottedtocline`

```
200 </2ekernel>
201 <*2ekernel | latexrelease>
202 <latexrelease>\IncludeInRelease{2018/12/01}%
203 <latexrelease>{\@dottedtocline}{Prevent protrusion}%
204 \def\@dottedtocline#1#2#3#4#5{%
205   \ifnum #1>\c@tocdepth \else
206     \vskip \z@ \@plus.2\p@
207     {\leftskip #2\relax \rightskip \@tocrmarg \parfillskip -\rightskip
208      \parindent #2\relax\@afterindenttrue
209      \interlinepenalty\@M
210      \leavevmode
211      \@tempdima #3\relax
212
213      \advance\leftskip \@tempdima \null\nobreak\hskip -\leftskip
214      {#4}\nobreak
215      \leaders\hbox{$\m@th
```

If a document uses fonts other than computer modern, the use of a dot from math can be very disturbing despite the fact that this might be the only place in a document that then uses computer modern. Therefore we surround the dot with an `\hbox` to escape to the surrounding text font.

```
215       \mkern \@dotsep mu\hbox{.}\mkern \@dotsep
216       mu$}\hfill
217       \nobreak
218       \hb@xt@\@pnumwidth{\hfil\normalfont \normalcolor #5%
```

We finish off by preventing any protrusion if that is enabled. If protrusion happens the number may shift to the right and as a result you may end up with an additional dot in the toc line in some situations.

```
219       \kern-\p@\kern\p@}%
220       \par}%
221       \fi}
```

(End definition for \@dottedtocline.)

**\noprotrusion** This command, if placed directly to the right (or left) of a word, will prevent protrusion of that word into the margin. It is used in the toc entry lines as they shouldn't protrude. It is implemented as to kerns that cancel each other but being there hide the word so that protrusion is not added. Note that a zero kern or an empty box would not work as the protrusion mechanism will skip over those.

```
222 \DeclareRobustCommand\noprotrusion{\leavevmode\kern-\p@\kern\p@}
```

(End definition for \noprotrusion.)

```
223 </2ekernel | latexrelease>
224 <latexrelease>\EndIncludeInRelease
225 <latexrelease>\IncludeInRelease{0000/00/00}%
226 <latexrelease>          {\@dottedtocline}{Prevent protrusion}%
227 <latexrelease>\def\@dottedtocline#1#2#3#4#5{%
228 <latexrelease>  \ifnum #1>\c@tocdepth \else
229 <latexrelease>    \vskip \z@ \@plus.2\p@
230 <latexrelease>    {\leftskip #2\relax \rightskip \@tocrmarg \parfillskip -\rightskip
231 <latexrelease>    \parindent #2\relax\@afterindenttrue
232 <latexrelease>    \interlinepenalty\@M
233 <latexrelease>    \leavevmode
234 <latexrelease>    \@tempdima #3\relax
235 <latexrelease>    \advance\leftskip \@tempdima \null\nobreak\hskip -\leftskip
236 <latexrelease>    {#4}\nobreak
237 <latexrelease>    \leaders\hbox{$\m@th
238 <latexrelease>      \mkern \@dotsep mu\hbox{.}\mkern \@dotsep
239 <latexrelease>      mu$}\hfill
240 <latexrelease>    \nobreak
241 <latexrelease>    \hb@xt@\@pnumwidth{\hfil\normalfont \normalcolor #5}%
242 <latexrelease>    \par}%
243 <latexrelease>  \fi}
244 <latexrelease>
245 <latexrelease>\let\noprotrusion\@undefined
246 <latexrelease>\EndIncludeInRelease
247 <*2ekernel>
```

**Note:** \nobreak's added 7 Jan 86 to prevent bad line break that left the page number dangling by itself at left edge of a new line.

Changed 25 Jan 88 to use \leftskip instead of \hangindent so leaders of multiple-line contents entries would line up properly.

**\numberline** \numberline{<number>}: For use in a \contentsline command. It puts <number> flush-left in a box of width \@tempdima (Before 25 Jan 88 change, it also added \@tempdima to the hanging indentation.)

```
248 \def\numberline#1{\hb@xt@\@tempdima{#1\hfil}}
249 </2ekernel>
```

(End definition for \numberline.)

# File P

## ltfloat.dtx

### 1 Floats

The different types of floats are identified by a  $\langle type \rangle$  name, which is the name of the counter for that kind of float. For example, figures are of type ‘figure’ and tables are of type ‘table’. Each  $\langle type \rangle$  has associated a positive  $\langle type\ number \rangle$ , which is a power of two. E.g., figures might have type number 1, tables type number 2, programs type number 4, etc.

The locations where a float can go are specified by a  $\langle placement\ specifier \rangle$ , which is a list of the possible locations, each denoted by a letter as follows:

h : here	— at the current location in the text.
t : top	— at the top of a text page.
b : bottom	— at the bottom of a text page.
p : page	— on a separate float page

In addition, in conjunction with these, you can use ‘!’ which means that the current values of the float positioning parameters are ignored for this float. (Has no effect on ‘p’, float page positioning.) For example, ‘pht’ specifies that the float can appear in any of three locations: page, here or top.

#### 1.1 Floating Environments

```
1 \*2ekernel
2 \message{floats,}
```

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

Where floats may appear on a page, and how many may appear there are specified by the following float placement parameters. The numbers are named like counters so the user can set them with the ordinary counter-setting commands.

<code>\c@topnumber</code>	: Number of floats allowed at the top of a column.
<code>\topfraction</code>	: Fraction of column that can be devoted to floats.
<code>\c@dbltopnumber, \dbltopfraction</code>	: Same as above, but for double-column floats.
<code>\c@bottomnumber, \bottomfraction</code>	: Same as above for bottom of page.
<code>\c@totalnumber</code>	: Number of floats allowed in a single column, including in-text floats.
<code>\textfraction</code>	: Minimum fraction of column that must contain text.
<code>\floatpagefraction</code>	: Minimum fraction of page that must be taken up by float page.
<code>\dblfloatpagefraction</code>	: Same as above, for double-column floats.



The document style must define the following.

`\fps@TYPE` : The default placement specifier for floats of type TYPE.

`\ftype@TYPE` : The type number for floats of type TYPE.

`\ext@TYPE` : The file extension indicating the file on which the contents list for float type TYPE is stored.  
For example, `\ext@figure = 'lof'`.

`\fnum@TYPE` : A macro to generate the figure number for a caption.  
For example, `\fnum@TYPE == Figure \thefigure`.

`\@makecaption{NUM}{TEXT}` :  
A macro to make a caption, with NUM the value produced by `\fnum@...` and TEXT the text of the caption. It can assume it's in a `\parbox` of the appropriate width.

`\@float{TYPE}[PLACEMENT]` : This macro begins a float environment for a single-column float of type TYPE with PLACEMENT as the placement specifier. The default value of PLACEMENT is defined by `\fps@TYPE`. The environment is ended by `\end@float`.  
E.g., `\figure == \@float{figure}, \endfigure == \end@float`.

```
\@float{TYPE}[PLACEMENT] ==
BEGIN
  if hmode then \@bsphack
    \@floatpenalty := -10002
  else \@floatpenalty := -10003
  fi
  \@captype ==L TYPE
  \@dblflset
  \@fps ==L PLACEMENT
  \@onelevel@sanitize \@fps
  add default PLACEMENT if at most ! in PLACEMENT ==
\@fpsadddefault
  if inner
    then LaTeX Error: 'Not in outer paragraph mode.'
    \@floatpenalty := 0
  else if \@freelist nonempty
    then \@currbox :=L head of \@freelist
    \@freelist :=G tail of \@freelist
    \count\@currbox :=G 32*\ftype@TYPE +
                                bits determined by PLACEMENT
    else \@floatpenalty := 0
    LaTeX Error: 'Too many unprocessed floats'
  fi
fi
\@currbox :=G \color@vbox
```

```

\normalcolor
\ vbox{
  %% 15 Dec 87 -
  %% removed \boxmaxdepth :=L 0pt
  %% that made box 0 depth because it screwed
  %% things up. Instead, added \vskip0pt at end
  \hsize = \columnwidth
  \@parboxrestore
  \@floatboxreset
END

```

```

\caption ==
BEGIN
  \refstepcounter{\@capttype}
  \@dblarg{\caption{\@capttype}}
END

```

In following definition, `\par` moved from after `\addcontentsline` to before `\addcontentsline` because the `\write` could cause an extra blank line to be added to the paragraph above the caption. (Change made 12 Jun 87)

```

\@caption{TYPE}[STEXT]{TEXT} ==
BEGIN
  \par
  \addcontentsline{\ext@TYPE}{TYPE}{\numberline{\theTYPE}{STEXT}}
  \begingroup
    \@parboxrestore
    \@normalsize
    \@makecaption{\fnum@TYPE}{TEXT}
  \par
  \endgroup
END

```

`\@dblfloat{TYPE}[PLACEMENT]` : Macro to begin a float environment for a double-column float of type TYPE with PLACEMENT as the placement specifier. The default value of PLACEMENT is 'tp'

The environment is ended by `\end@dblfloat`.

E.g., `\figure* == \@dblfloat{figure}`,

`\endfigure* == \end@dblfloat`.

```

\@dblfloat{TYPE}[PLACEMENT] ==
  Identical to \@float{TYPE}[PLACEMENT] except \hsize and \linewidth
  are set to \textwidth.

```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

`\@floatpenalty`

```

3 \newcount\@floatpenalty

```

*(End definition for \@floatpenalty.)*

`\caption` This is set to be an error message outside a float since no `captype` is defined there; this may need to be changed by some classes.

```

4 \def\caption{%
5   \ifx\@captype\@undefined
6     \latexerror{\noexpand\caption outside float}\@ehd
7     \expandafter\@gobble
8   \else
9     \refstepcounter\@captype
10    \expandafter\@firstofone
11  \fi
12  {\@dblarg{\@caption\@captype}}%
13 }
```

*(End definition for \caption.)*

`\@caption`

```

14 \long\def\@caption#1[#2]#3{%
15   \par
16   \addcontentsline{\csname ext@#1\endcsname}{#1}%
17   {\protect\numberline{\csname the#1\endcsname}{\ignorespaces #2}}%
18   \begingroup
```

The paragraph setting parameters are normalised at this point, however `\@parboxrestore` resets `\everypar` which is not correct in this context so `\@setminipage` is called if needed.

The float mechanism, like `minipage`, sets the flag `@minipage` true before executing the user-supplied text. Many L<sup>A</sup>T<sub>E</sub>X constructs test for this flag and do not add vertical space when it is true. The intention is that this emulates T<sub>E</sub>X's 'top of page' behaviour. The flag must be set false at the start of the first paragraph. This is achieved by a redefinition of `\everypar`, but the call to `\@parboxrestore` removes that redefinition, so it is re-inserted if needed. If the flag is already false then the `\caption` was not the first entry in the float, and so some other paragraph has already activated the special `\everypar`. In this case no further action is needed.

```

19   \@parboxrestore
20   \if@minipage
21     \@setminipage
22   \fi
23   \normalsize
24   \@makecaption{\csname fnum@#1\endcsname}{\ignorespaces #3}\par
25   \endgroup
```

*(End definition for \@caption.)*

`\@float`  
`\@dblflset`

```

26 \def\@float#1{%
27   \@ifnextchar[%
28     {\@xfloat{#1}}%
29     {\edef\reserved@a{\noexpand\@xfloat{#1}[\csname fps@#1\endcsname]}}%
30     \reserved@a}}
```

*(End definition for \@float and \@dblflset.)*

`\@dblfloat`

```

31 \def\@dblfloat{%
32   \if@twocolumn\let\reserved@a\@dblft\else\let\reserved@a\@float\fi
33   \reserved@a}
```

(End definition for \dblfloat.)

\fps@dbl Note that all double floats have default fps ‘tp’.

(End definition for \fps@dbl.)

\@setfps This sets the fps, dealing with error conditions by adding the default.

(End definition for \@setfps.)

\@xfloat The first part of this sets the count register that stores all the information about the type and fps of the float.

We assume here that the default specifiers already contain no active characters.

It may be better to store the defaults as numbers, rather than symbol strings.

```
34 </2kernel>
35 <latexrelease>\IncludeInRelease{2015/01/01}%
36 <latexrelease>          {\@xfloat}{Check float options}%
37 <*2kernel | latexrelease>
38 \def\@xfloat #1[#2]{%
39   \@nodocument
40   \def \@capytype {#1}%
41   \def \@fps {#2}%
42   \@onelevel@sanitize \@fps
43   \def \reserved@a {!}%
44   \ifx \reserved@a \@fps
45     \fpsadddefault
46   \else
47     \ifx \@fps \@empty
48       \fpsadddefault
49     \fi
50   \fi
51   \ifhmode
52     \bsphack
53     \@floatpenalty -\@Mii
54   \else
55     \@floatpenalty-\@Miii
56   \fi
57   \ifinner
58     \@parmoderr\@floatpenalty\z@
59   \else
60     \@next\@currbox\@freelist
61     {%
62       \@tempcnta \sixt@@n
63       \expandafter \@tfor \expandafter \reserved@a
64       \expandafter : \expandafter =\@fps
65       \do
```

Start of changes, use a nested if structure, ending in an error.

```
66       {%
67         \if \reserved@a h%
68           \ifodd \@tempcnta
69             \else
70               \advance \@tempcnta \@ne
71             \fi
```

```

72         \else\if \reserved@a t%
73             \@setfpsbit \tw@
74         \else\if \reserved@a b%
75             \@setfpsbit 4%
76         \else\if \reserved@a p%
77             \@setfpsbit 8%
78         \else\if \reserved@a !%
79             \ifnum \@tempcnta>15
80                 \advance\@tempcnta -\sixt@@n\relax
81             \fi
82         \else
83             \@latex@error{Unknown float option ‘\reserved@a’}%
84             {Option ‘\reserved@a’ ignored and ‘p’ used.}%
85             \@setfpsbit 8%
86         \fi\fi\fi\fi\fi
87     }%

```

End of changes

```

88         \@tempcntb \csname ftype@\@capttype \endcsname
89         \multiply \@tempcntb \@xxxii
90         \advance \@tempcnta \@tempcntb
91         \global \count\@currbox \@tempcnta
92     }%
93     \@fltovf
94 \fi

```

The remainder sets up the box in which the float is typeset, and the typesetting environment to be used. It is essential to have the extra box to avoid the unwanted space that would otherwise often be put at the top of the float.

It ends with a hook; not sure how useful this is but it is needed at present to deal with double-column floats.

```

95     \global \setbox\@currbox
96         \color@vbox
97         \normalcolor
98         \vbox \bgroup
99             \hsize\columnwidth
100             \@parboxrestore
101             \@floatboxreset
102     }%
103 </2ekernel | latexrelease>
104 <latexrelease>\EndIncludeInRelease
105 <latexrelease>\IncludeInRelease{0000/00/00}%
106 <latexrelease>          {\@xfloat}{Check float options}%
107 <latexrelease>\def\@xfloat #1[#2]{%
108 <latexrelease>    \@nodocument
109 <latexrelease>    \def \@capttype {#1}%
110 <latexrelease>    \def \@fps {#2}%
111 <latexrelease>    \@onelevel@sanitize \@fps
112 <latexrelease>    \def \reserved@b {!}%
113 <latexrelease>    \ifx \reserved@b \@fps
114 <latexrelease>        \@fpsadddefault
115 <latexrelease>    \else
116 <latexrelease>        \ifx \@fps \@empty
117 <latexrelease>            \@fpsadddefault

```

```

118 <latexrelease> \fi
119 <latexrelease> \fi
120 <latexrelease> \ifhmode
121 <latexrelease> \@bsphack
122 <latexrelease> \@floatpenalty -\@Mii
123 <latexrelease> \else
124 <latexrelease> \@floatpenalty-\@Miii
125 <latexrelease> \fi
126 <latexrelease> \ifinner
127 <latexrelease> \@parmoderr\@floatpenalty\z@
128 <latexrelease> \else
129 <latexrelease> \@next\@currbox\@freelist
130 <latexrelease> {%
131 <latexrelease> \@tempcnta \sixt@@n
132 <latexrelease> \expandafter \@tfor \expandafter \reserved@a
133 <latexrelease> \expandafter :\expandafter =\@fps
134 <latexrelease> \do
135 <latexrelease> {%
136 <latexrelease> \if \reserved@a h%
137 <latexrelease> \ifodd \@tempcnta
138 <latexrelease> \else
139 <latexrelease> \advance \@tempcnta \@ne
140 <latexrelease> \fi
141 <latexrelease> \fi
142 <latexrelease> \if \reserved@a t%
143 <latexrelease> \@setfpsbit \tw@
144 <latexrelease> \fi
145 <latexrelease> \if \reserved@a b%
146 <latexrelease> \@setfpsbit 4%
147 <latexrelease> \fi
148 <latexrelease> \if \reserved@a p%
149 <latexrelease> \@setfpsbit 8%
150 <latexrelease> \fi
151 <latexrelease> \if \reserved@a !%
152 <latexrelease> \ifnum \@tempcnta>15
153 <latexrelease> \advance\@tempcnta -\sixt@@n\relax
154 <latexrelease> \fi
155 <latexrelease> \fi
156 <latexrelease> }%
157 <latexrelease> \@tempcntb \csname ftype@\@capttype \endcsname
158 <latexrelease> \multiply \@tempcntb \@xxxii
159 <latexrelease> \advance \@tempcnta \@tempcntb
160 <latexrelease> \global \count\@currbox \@tempcnta
161 <latexrelease> }%
162 <latexrelease> \@fltovf
163 <latexrelease> \fi
164 <latexrelease> \global \setbox\@currbox
165 <latexrelease> \color@vbox
166 <latexrelease> \normalcolor
167 <latexrelease> \vbox \bgroup
168 <latexrelease> \hsize\columnwidth
169 <latexrelease> \@parboxrestore
170 <latexrelease> \@floatboxreset
171 <latexrelease> }%

```

```

172 \latexrelease\EndIncludeInRelease
173 \*2ekernel)

```

(End definition for \@xfloat.)

**\@floatboxreset** The rationale for allowing these normally global flags to be set locally here, via **\@parboxrestore**, was stated originally by Donald Arseneau and extended by Chris Rowley. It is because these flags are only set globally to true by section commands, and these should never appear within marginals or floats or, indeed, in any group; and they are only ever set globally to false when they are definitely true.

If anyone is unhappy with this argument then both flags should be treated as in **\set@nobreak**; otherwise this command will be redundant.

```

174 \def \@floatboxreset {%
175     \reset@font
176     \normalsize
177     \@setminipage
178 }

```

(End definition for \@floatboxreset.)

**\@setnobreak**

```

179 \def \@setnobreak{%
180     \if@nobreak
181         \let\outer@nobreak\@nobreaktrue
182         \@nobreakfalse
183     \fi
184 }

```

(End definition for \@setnobreak.)

**\@setminipage**

```

185 \def \@setminipage{%
186     \@minipagetrue
187     \everypar{\@minipagefalse\everypar{}}%
188 }

```

(End definition for \@setminipage.)

**\end@float**

```

189 \def\end@float{%
190     \@endfloatbox
191     \ifnum\@floatpenalty <\z@

```

We make sure that we never exceed **\textheight**, otherwise float will never get typeset (91/03/15 FMi).

```

192     \@largefloatcheck
193     \@cons\@currlist\@currbox
194     \ifnum\@floatpenalty <-\@Mii
195         \penalty -\@Miv

```

Saving and restoring **\prevdepth** added 26 May 87 to prevent extra vertical space when used in vertical mode.

```

196     \@tempdima\prevdepth
197     \vbox{}%
198     \prevdepth\@tempdima

```

```

199     \penalty\@floatpenalty

200     \else
201     \vadjust{\penalty -\@Miv \vbox{}\penalty\@floatpenalty}\@Esphack
202     \fi
203     \fi
204 }

```

(End definition for \end@float.)

\end@dblfloat

```

205 </2ekernel>
206 <latexrelease>\IncludeInRelease{2015/01/01}%
207 <latexrelease>           {\end@dblfloat}{float order in 2-column}%
208 <*2ekernel | latexrelease>
209 \def\end@dblfloat{%
210     \if@twocolumn
211     \endfloatbox
212     \ifnum\@floatpenalty <\z@
213     \@largefloatcheck
214     \global\dp\@currbox1sp %
215     \ifnum\@floatpenalty <-\@Mii
216     \penalty -\@Miv
217     \@tempdima\prevdepth
218     \vbox{}%
219     \prevdepth\@tempdima
220     \penalty\@floatpenalty
221     \else
222     \vadjust{\penalty -\@Miv \vbox{}\penalty\@floatpenalty}\@Esphack
223     \fi
224
225     \fi
226     \else
227     \end@float
228     \fi
229 }%
230 </2ekernel | latexrelease>
231 <latexrelease>\EndIncludeInRelease
232 <latexrelease>\IncludeInRelease{0000/00/00}%
233 <latexrelease>           {\end@dblfloat}{float order in 2-column}%
234 <latexrelease>\def\end@dblfloat{%
235 <latexrelease>\if@twocolumn
236 <latexrelease> \endfloatbox
237 <latexrelease> \ifnum\@floatpenalty <\z@

```

We make sure that we never exceed \textheight, otherwise float will never get typeset (91/03/15 FMi).

```

238 <latexrelease> \@largefloatcheck
239 <latexrelease> \@cons\@dbldeferlist\@currbox
240 <latexrelease> \fi

```



RmS 92/03/18 changed \@esphack to \@Esphack.

```

241 <latexrelease>    \ifnum \@floatpenalty =-\@Mii \@Esphack\fi
242 <latexrelease>\else
243 <latexrelease>    \end@float
244 <latexrelease>\fi
245 <latexrelease>}%
246 <latexrelease>\EndIncludeInRelease
247 <*2ekernel>

```

(End definition for \enddblfloat.)

**\@endfloatbox** This macro is not intended to be a hook; it is designed to help maintain the integrity of this code, which is used twice and, as can be seen, is subject to frequent changes.

```

248 \def \@endfloatbox{%
249     \par\vskip\z@skip      %% \par\vskip\z@ added 15 Dec 87

250     \@minipagefalse
251     \outer@nobreak
252     \egroup                %% end of vbox
253     \color@endbox
254 }

```

(End definition for \@endfloatbox.)

**\outer@nobreak**

```

255 \let\outer@nobreak\@empty

```

(End definition for \outer@nobreak.)

**\@largefloatcheck** This calculates by how much a float is oversize for the page and prints this in a warning message.

```

256 \def \@largefloatcheck{%
257     \ifdim \ht\@currbox>\textheight
258         \@tempdima -\textheight
259         \advance \@tempdima \ht\@currbox

260         \@latex@warning {Float too large for page by \the\@tempdima}%
261         \ht\@currbox \textheight
262     \fi
263 }

```

(End definition for \@largefloatcheck.)

**\@dbflt**

**\@xdblfloat**

```

264 \def\@dbflt#1{\@ifnextchar[{\@xdblfloat{#1}}{\@xdblfloat{#1}[tp]}}
265 \def\@xdblfloat#1[#2]{%
266     \@xfloat{#1}[#2]\hsize\textwidth\linewidth\textwidth}

```

(End definition for \@dbflt and \@xdblfloat.)

Moved to ltoutput 93/12/16

```

267 %\newcount\c@topnumber
268 %\newcount\c@dbltopnumber
269 %\newcount\c@bottomnumber
270 %\newcount\c@totalnumber

```

`\@floatplacement` An analysis of `\@floatplacement`:  
This should be called whenever `\@colht` has been set.

```

271 \def\@floatplacement{\global\@topnum\c@topnumber
272   % Textpage bit, global:
273   \global\@toproom \topfraction\@colht
274   \global\@botnum \c@bottomnumber
275   \global\@botroom \bottomfraction\@colht
276   \global\@colnum \c@totalnumber
277   % Floatpage bit, local:
278   \@fpmin \floatpagefraction\@colht}
279 \endkernel

```

(End definition for `\@floatplacement`.)

`\@dblfloatplacement` This should be called only within a group. Now changed to provide extra checks in `\@addtodblcol`, needed when processing a BANG float.

```

280 \latexrelease\IncludeInRelease{2015/01/01}%
281 \latexrelease \@dblfloatplacement{float order in 2-column}%
282 \endkernel | latexrelease

```

When making two column float area, look for floats with 1sp depth.

```

283 \def\@dblfloatplacement{\global\@dbltopnum\c@dbltopnumber
284   \global\@dbltoproom \dbltopfraction\@colht
285   \@textmin \@colht
286   \advance \@textmin -\@dbltoproom
287   \@fpmin \dblfloatpagefraction\textheight
288   \fptop \@dblfpsep
289   \fpsep \@dblfpsep
290   \fpbot \@dblfpbot

```

`\f@depth` is used in `\@testwrongwidth` to look for either column or dbl-column floats. A value of 1sp signals the latter. Because of this setting here, `\@dblfloatplacement` needs to be called inside a group which is a questionable design.

```

291 \def\f@depth{1sp}%
292 \endkernel | latexrelease
293 \latexrelease\EndIncludeInRelease
294 \latexrelease\IncludeInRelease{0000/00/00}%
295 \latexrelease \@dblfloatplacement{float order in 2-column}%
296 \latexrelease\def \@dblfloatplacement {%

```

Textpage bit: global, but need not be.

```

297 \latexrelease \global \@dbltopnum \c@dbltopnumber
298 \latexrelease \global \@dbltoproom \dbltopfraction\@colht

```

This new bit uses `\@textmin` to locally store the amount of extra room in the column.

```

299 \latexrelease \@textmin \@colht
300 \latexrelease \advance \@textmin -\@dbltoproom

```

Floatpage bit: must be local.

```

301 \latexrelease \@fpmin \dblfloatpagefraction\textheight
302 \latexrelease \fptop \@dblfpsep
303 \latexrelease \fpsep \@dblfpsep
304 \latexrelease \fpbot \@dblfpbot
305 \latexrelease}%
306 \latexrelease\EndIncludeInRelease
307 \endkernel

```

(End definition for `\dblfloatplacement`.)

Historical *LaTeX* 2.09 comments (not necessarily accurate any more):

MARGINAL NOTES:

Marginal notes use the same mechanism as floats to communicate with the `\output` routine. Marginal notes are distinguished from floats by having a negative placement specification. The command `\marginpar [LTEXT]{RTEXT}` generates a marginal note in a parbox, using LTEXT if it's on the left and RTEXT if it's on the right. (Default is RTEXT = LTEXT.) It uses the following parameters.

`\marginparwidth` : Width of marginal notes.  
`\marginparsep` : Distance between marginal note and text.  
the page layout to determine how to move the marginal  
note into the margin. E.g., `\leftmargin skip ==`  
`\hskip -\marginparwidth \hskip -\marginparsep` .  
`\marginparpush` : Minimum vertical separation between `\marginpar`'s

Marginal notes are normally put on the outside of the page if `@mparswitch = true`, and on the right if `@mparswitch = false`. The command `\reversemarginpar` reverses the side where they are put. `\normalmarginpar` undoes `\reversemarginpar`. These commands have no effect for two-column output.

SURPRISE: if two marginal notes appear on the same line of text, then the second one could appear on the next page, in a funny position.

```
\marginpar [LTEXT]{RTEXT} ==
BEGIN
  if hmode then \bsphack
    \floatpenalty := -10002
  else \floatpenalty := -10003
  fi
  if inner
    then LaTeX Error: 'Not in outer paragraph mode.'
    \floatpenalty := 0
  else if \freelist has two elements:
    then get \marbox, \currbox from \freelist
    \count\marbox := G -1
  else \floatpenalty := 0
    LaTeX Error: 'Too many unprocessed floats'
    \currbox, \marbox := \tempboxa %%use \def
  fi
fi
if optional argument
  then %% \xmpar ==
    \savemarbox\marbox{LTEXT}
    \savemarbox\currbox{RTEXT}
```

```

        else %% \ympar ==
            \@savemarbox\@marbox{RTEXT}
            \box\@currbox :=G \box\@marbox
        fi
        \@xympar
    END

\reversemarginpar == BEGIN \@mparbottom :=G 0
                        @reversemargin :=G true
                        END

\normalmarginpar == BEGIN \@mparbottom :=G 0
                        @reversemargin :=G false
                        END

```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

**\marginpar**

```

308 \def\marginpar{%
309     \ifhmode
310         \@bsphack
311         \@floatpenalty -\@Mii
312     \else
313         \@floatpenalty-\@Miii
314     \fi
315     \ifinner
316         \@parmoderr
317         \@floatpenalty\z@
318     \else
319         \@next\@currbox\@freelist{}\{}%
320         \@next\@marbox\@freelist{\global\count\@marbox\m@ne}%
321         {\@floatpenalty\z@
322         \@fltovf\def\@currbox{\@tempboxa}\def\@marbox{\@tempboxa}}}%
323     \fi
324     \@ifnextchar [\@xmpar\ympar}

```

*(End definition for \marginpar.)*

**\@xmpar**

```

325 \long\def\@xmpar[#1]#2{%
326     \@savemarbox\@marbox{#1}%
327     \@savemarbox\@currbox{#2}%
328     \@xympar}

```

*(End definition for \@xmpar.)*

**\@ympar**

```

329 \long\def\@ympar#1{%
330     \@savemarbox\@marbox{#1}%
331     \global\setbox\@currbox\copy\@marbox
332     \@xympar}

```

*(End definition for \@ympar.)*

`\@savemarbox`

```

333 </2ekernel>
334 <*2ekernel | latexrelease>
335 <latexrelease>\IncludeInRelease{2021/06/01}%
336 <latexrelease>          {\@savemarbox}{Explicit par for marginpar}%
337 \long\def \@savemarbox #1#2{%
338   \global\setbox #1%
339   \color@vbox
340   \vtop{%
341     \hsize\marginparwidth
342     \@parboxrestore
343     \@marginparreset
344     #2\par
345     \@minipagefalse
346     \outer@nobreak
347   }%
348   \color@endbox
349 }
350 </2ekernel | latexrelease>
351 <latexrelease>\EndIncludeInRelease
352 <latexrelease>\IncludeInRelease{0000/00/00}%
353 <latexrelease>          {\@savemarbox}{Explicit par for marginpar}%
354 <latexrelease>
355 <latexrelease>\long\def \@savemarbox #1#2{%
356 <latexrelease>  \global\setbox #1%
357 <latexrelease>    \color@vbox
358 <latexrelease>    \vtop{%
359 <latexrelease>      \hsize\marginparwidth
360 <latexrelease>      \@parboxrestore
361 <latexrelease>      \@marginparreset
362 <latexrelease>      #2%
363 <latexrelease>      \@minipagefalse
364 <latexrelease>      \outer@nobreak
365 <latexrelease>      }%
366 <latexrelease>    \color@endbox
367 <latexrelease>}
368 <latexrelease>\EndIncludeInRelease
369 <*2ekernel>

```

*(End definition for \@savemarbox.)*

`\@marginparreset` The rationale for allowing these normally global flags to be set locally here, via `\@parboxrestore` was stated originally by Donald Arseneau and extended by Chris Rowley. It is because these flags are only set globally to true by section commands, and these should never appear within marginals or floats or, indeed, in any group; and they are only ever set globally to false when they are definitely true.

If anyone is unhappy with this argument then both flags should be treated as in `\set@nobreak`; otherwise this command will be redundant.

```

370 \def \@marginparreset {%
371   \reset@font
372   \normalsize
373 %   \let@if@nobreak\iffalse
374 %   \let@if@noskipsec\iffalse

```

```

375 %          \@setnobreak
376          \@setminipage
377 }

(End definition for \@marginparreset.)

```

`\@xympar`

Setting the box here is done only because the code uses `\end@float`; it will be empty and gets discarded.

```

378 \def \@xympar{%
379   \ifnum \@floatpenalty < \z@ \@cons \@currlist \@marbox \fi
380   \setbox \@tempboxa
381     \color@vbox
382     \vbox \bgroup
383   \end@float
384   \@ignorefalse
385   \@esphack
386 }

(End definition for \@xympar.)

```

`\reversemarginpar`

`\normalmarginpar`

```

387 \def \reversemarginpar {\global \@parbottom \z@ \@reversemargintrue}
388 \def \normalmarginpar {\global \@parbottom \z@ \@reversemarginfalse}

(End definition for \reversemarginpar and \normalmarginpar.)

389 \message{footnotes,}

```

## 1.2 Footnotes

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

`\footnote{NOTE}` : User command to insert a footnote.

`\footnote[NUM]{NOTE}`: User command to insert a footnote numbered *NUM*, where *NUM* is a number – 1, 2, etc. For example, if footnotes are numbered \*, \*\*, etc. within pages, then `\footnote[2]{...}` produces footnote ‘\*\*’. This command does not step the footnote counter.

`\footnotemark[NUM]` : Command to produce just the footnote mark in the text, but no footnote. With no argument, it steps the footnote counter before generating the mark.

`\footnotetext[NUM]{TEXT}` : Command to produce the footnote but no mark. `\footnote` is equivalent to `\footnotemark \footnotetext` .

As in PLAIN, footnotes use `\insert\footins`, and the following parameters:

`\footnotesize` : Size-changing command for footnotes.

`\footnotesep` : The height of a strut placed at the beginning of every footnote.

`\skip\footins` : Space between main text and footnotes. The rule separating footnotes from text occurs in this space. This space lies above the strut of height `\footnotesep` which is at the beginning of the first footnote.

`\footnoterule` : Macro to draw the rule separating footnotes from text. It is executed right after a `\vspace` of `\skip\footins`. It should take zero vertical space—i.e., it should to a negative skip to compensate for any positive space it occupies. (See PLAIN.TEX.)

`\interfootnotelinepenalty` : Interline penalty for footnotes.

`\thefootnote` : In usual LaTeX style, produces the footnote number. If footnotes are to be numbered within pages, then the document style file must include an `\@addtoreset` command to cause the footnote counter to be reset when the page counter is stepped. This is not a good idea, though, because the counter will not always be reset in time to ensure that the first footnote on a page is footnote number one.

`\@thefnmark` : Holds the current footnote's mark—e.g., `\dag` or `'1'` or `'a'`.

`\@mpfnnumber` : A macro that generates the numbers for `\footnote` and `\footnotemark` commands. It == `\thefootnote` outside a minipage environment, but can be changed inside to generate numbers for `\footnote`'s.

`\@makefnmark` : A macro to generate the footnote marker from `\@thefnmark`. The default definition was `\hbox{$\@thefnmark$}`.

This is now replaced by  
`\textsuperscript{\@thefnmark}`

`\@makefntext{NOTE}` :  
 Must produce the actual footnote, using `\@thefnmark` as the mark of the footnote and `NOTE` as the text. It is called when effectively inside a `\parbox`, with `\hsize = \columnwidth`.  
 For example, it might be as simple as  
`$\@thefnmark$ NOTE`

In a minipage environment, `\footnote` and `\footnotetext` are redefined so that

- (a) they use the counter `mpfootnote`
- (b) the footnotes they produce go at the bottom of the minipage.

The switch is accomplished by letting `\@mpfn == footnote` or `mpfootnote` and `\thempfn == \thefootnote` or `\thempfootnote`, and by redefining `\@footnotetext` to be `\@mpfootnotetext` in the minipage.

```
\footnote{NOTE} ==
BEGIN
  \stepcounter{\@mpfn}
  begingroup
    \protect == \noexpand
    \@thefnmark :=G eval (\thempfn)
  endgroup
  \@footnotemark
  \@footnotetext{NOTE}
END

\footnote[NUM]{NOTE} ==
BEGIN
  begingroup
    \protect == \noexpand
    counter \@mpfn :=L NUM
    \@thefnmark :=G eval (\thempfn)
  endgroup
  \@footnotemark
  \@footnotetext{NOTE}
END

\footnotemark ==
BEGIN \stepcounter{footnote}
  begingroup
    \protect == \noexpand
    \@thefnmark :=G eval(\thefootnote)
  endgroup
  \@footnotemark
END

\footnotemark[NUM] ==
BEGIN
  begingroup
    footnote counter :=L NUM
    \protect == \noexpand
    \@thefnmark :=G eval(\thefootnote)
  endgroup
  \@footnotemark
END
```



```

\@footnotemark ==
  BEGIN
    \leavevmode
    IF hmode THEN \@x@sf := \the\spacefactor FI
    \@makefnmark          % put number in main text
    IF hmode THEN \spacefactor := \@x@sf FI
  END

\footnotetext      ==
  BEGIN begingroup \protect == \noexpand
    \@thefnmark :=G eval (\thempfn)
  endgroup
  \@footnotetext
  END

\footnotetext[ NUM ] ==
  BEGIN begingroup counter \@mpfn :=L NUM
    \protect == \noexpand
    \@thefnmark :=G eval (\thempfn)
  endgroup
  \@footnotetext
  END

```

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

**\footins** L<sup>A</sup>T<sub>E</sub>X does use the same insert for footnotes as PLAIN.

```

390 \newinsert\footins

```

L<sup>A</sup>T<sub>E</sub>X leaves these initializations for the \footins insert.

```

391 \skip\footins=\bigskipamount % space added when footnote is present
392 \count\footins=1000 % footnote magnification factor (1 to 1)
393 \dimen\footins=8in % maximum footnotes per page

```

*(End definition for \footins.)*

**\footnoterule** L<sup>A</sup>T<sub>E</sub>X keeps PLAIN T<sub>E</sub>X's \footnoterule as the default.

```

394 \def\footnoterule{\kern-3\p@
395   \hrule \@width 2in \kern 2.6\p@} % the \hrule is .4pt high

```

*(End definition for \footnoterule.)*

**\thefootnote**

```

396 \@definecounter{footnote}
397 \def\thefootnote{\@arabic\c@footnote}

```

*(End definition for \thefootnote.)*

**\thempfootnote** The default display for the footnote counter in minipages is to use italic letters. We use \itshape not \textit as the latter would add an italic correction.

```

398 \@definecounter{mpfootnote}
399 \def\thempfootnote{{\itshape\@alph\c@mpfootnote}}

```

*(End definition for \thempfootnote.)*

`\@makefnmark` Default definition.

```
400 %\def\@makefnmark{\hbox{$\sim\@thefnmark}\m@th$}%
401 \def\@makefnmark{\hbox{\@textsuperscript{\normalfont\@thefnmark}}}
```

*(End definition for \@makefnmark.)*

`\textsuperscript` This command provides superscript characters in the current text font. It's implementation might change!!!

```
402 \DeclareRobustCommand*\textsuperscript[1]{%
403   \@textsuperscript{\selectfont#1}}
```

*(End definition for \textsuperscript.)*

`\@textsuperscript` This command should not be used directly, but may be used to define other commands `\textsuperscript`, `\@makefnmark`. #1 should always start with a font selection command, to activate the font size switch.

```
404 \</2ekernel>
405 \<*2ekernel | latexrelease>
406 \<latexrelease>\IncludeInRelease{2020/10/01}%
407 \<latexrelease>          {\@textsuperscript}{superscript baseline}%
408 \def\@textsuperscript#1{%
409   {\m@th\ensuremath{\sim\hbox{\fontsize\sf@size\sf@size#1}}}}
410 \</2ekernel | latexrelease>
411 \<latexrelease>\EndIncludeInRelease
412 \<latexrelease>\IncludeInRelease{0000/00/00}%
413 \<latexrelease>          {\@textsuperscript}{superscript baseline}%
414 \<latexrelease>
415 \<latexrelease>\def\@textsuperscript#1{%
416 \<latexrelease>   {\m@th\ensuremath{\sim\hbox{\fontsize\sf@size\z@#1}}}}
417 \<latexrelease>\EndIncludeInRelease
418 \<*2ekernel>
```

*(End definition for \@textsuperscript.)*

`\textsubscript`

```
419 \</2ekernel>
420 \<latexrelease>\IncludeInRelease{2015/01/01}%
421 \<latexrelease>          {\textsubscript}{\textsubscript}%
422 \<*2ekernel | latexrelease>
423 \DeclareRobustCommand*\textsubscript[1]{%
424   \@textsubscript{\selectfont#1}}%
425 \</2ekernel | latexrelease>
426 \<latexrelease>\EndIncludeInRelease
427 \<latexrelease>\IncludeInRelease{0000/00/00}%
428 \<latexrelease>          {\textsubscript}{\textsubscript}%
429 \<latexrelease>\let\textsubscript\@undefined
430 \<latexrelease>\EndIncludeInRelease
431 \<*2ekernel>
```

*(End definition for \textsubscript.)*

`\@textsubscript`

```
432 </2ekernel>
433 <*2ekernel | latexrelease>
434 <latexrelease>\IncludeInRelease{2020/10/01}%
435 <latexrelease>          {\@textsubscript}{subscript baseline}%
436 \def\@textsubscript#1{%
437   {\m@th\ensuremath{_{\mbox{\fontsize\sf@size\sf@size#1}}}}
438 </2ekernel | latexrelease>
439 <latexrelease>\EndIncludeInRelease

440 <latexrelease>\IncludeInRelease{2015/01/01}%
441 <latexrelease>          {\@textsubscript}{subscript baseline}%
442 <latexrelease>
443 <latexrelease>\def\@textsubscript#1{%
444 <latexrelease>   {\m@th\ensuremath{_{\mbox{\fontsize\sf@size\z@#1}}}}
445 <latexrelease>\EndIncludeInRelease
446 <latexrelease>\IncludeInRelease{0000/00/00}%
447 <latexrelease>          {\@textsubscript}{subscript baseline}%
448 <latexrelease>\let\@textsubscript\undefined
449 <latexrelease>\EndIncludeInRelease
450 <*2ekernel>

(End definition for \@textsubscript.)
```

`\footnotesep`

```
451 \newdimen\footnotesep

(End definition for \footnotesep.)
```

`\footnote`

```
452 \def\footnote{\@ifnextchar[\@xfootnote{\stepcounter\@mpfn
453   \protected@xdef\@thefnmark{\thempfn}%
454   \@footnotemark\@footnotetext}}

(End definition for \footnote.)
```

`\@xfootnote`

```
455 \def\@xfootnote[#1]{%
456   \begingroup
457   \csname c@\@mpfn\endcsname #1\relax
458   \unrestored@protected@xdef\@thefnmark{\thempfn}%
459   \endgroup
460   \@footnotemark\@footnotetext}

(End definition for \@xfootnote.)
```

`\@footnotetext`

```
461 </2ekernel>
462 <*2ekernel | latexrelease>
463 <latexrelease>\IncludeInRelease{2021/11/15}%
464 <latexrelease>          {\@footnotetext}{footnotetext tagging}%
465 \long\def\@footnotetext#1{\insert\footins{%
466   \reset@font\footnotesize
467   \interlinepenalty\interfootnotelinepenalty
468   \splittopskip\footnotesep
```

```

469 \splitmaxdepth \dp\strutbox \floatingpenalty \@MM
470 \hsize\columnwidth \@parboxrestore
471 \def\@currentcounter{footnote}%
472 \protected@edef\@currentlabel{%
473   \csname p@footnote\endcsname\@thefnmark
474 }%
475 \color@begingroup
476   \@makefntext{%
477     \rule\z@\footnotesep\ignorespaces#1\@finalstrut\strutbox}%
478 \par
479 \color@endgroup}}}%
480 </2ekernel | latexrelease>
481 <latexrelease>\EndIncludeInRelease

482 <latexrelease>\IncludeInRelease{2021/06/01}%
483 <latexrelease>          {\@footnotetext}{footnotetext tagging}%
484 <latexrelease>\long\def\@footnotetext#1{\insert\footins{%
485 <latexrelease>    \reset@font\footnotesize
486 <latexrelease>    \interlinepenalty\interfootnotelinepenalty
487 <latexrelease>    \splittopskip\footnotesep
488 <latexrelease>    \splitmaxdepth \dp\strutbox \floatingpenalty \@MM
489 <latexrelease>    \hsize\columnwidth \@parboxrestore
490 <latexrelease>    \protected@edef\@currentlabel{%
491 <latexrelease>      \csname p@footnote\endcsname\@thefnmark
492 <latexrelease>    }%
493 <latexrelease>    \color@begingroup
494 <latexrelease>      \@makefntext{%
495 <latexrelease>        \rule\z@\footnotesep\ignorespaces#1\@finalstrut\strutbox}%
496 <latexrelease>    \par
497 <latexrelease>    \color@endgroup}}}%
498 <latexrelease>\EndIncludeInRelease

499 <latexrelease>\IncludeInRelease{0000/00/00}%
500 <latexrelease>          {\@footnotetext}{footnotetext tagging}%
501 <latexrelease>
502 <latexrelease>\long\def\@footnotetext#1{\insert\footins{%
503 <latexrelease>    \reset@font\footnotesize
504 <latexrelease>    \interlinepenalty\interfootnotelinepenalty
505 <latexrelease>    \splittopskip\footnotesep
506 <latexrelease>    \splitmaxdepth \dp\strutbox \floatingpenalty \@MM
507 <latexrelease>    \hsize\columnwidth \@parboxrestore
508 <latexrelease>    \protected@edef\@currentlabel{%
509 <latexrelease>      \csname p@footnote\endcsname\@thefnmark
510 <latexrelease>    }%
511 <latexrelease>    \color@begingroup
512 <latexrelease>      \@makefntext{%
513 <latexrelease>        \rule\z@\footnotesep\ignorespaces#1\@finalstrut\strutbox}%
514 <latexrelease>    \color@endgroup}}}%
515 <latexrelease>
516 <latexrelease>\EndIncludeInRelease
517 <*2ekernel>

```

*(End definition for \@footnotetext.)*

**\footnotemark**

```

518 \def\footnotemark{%
519   \@ifnextchar[\@xfootnotemark
520     {\stepcounter{footnote}%
521     \protected@xdef\@thefnmark{\thefootnote}%
522     \@footnotemark}}

(End definition for \footnotemark.)

\@xfootnotemark

523 \def\@xfootnotemark[#1]{%
524   \begingroup
525     \c@footnote #1\relax
526     \unrestored@protected@xdef\@thefnmark{\thefootnote}%
527   \endgroup
528   \@footnotemark}

(End definition for \@xfootnotemark.)

\@footnotemark

529 \def\@footnotemark{%
530   \leavevmode
531   \ifhmode\edef\x@sf{\the\spacefactor}\nobreak\fi
532   \@makefnmark
533   \ifhmode\spacefactor\x@sf\fi
534   \relax}

(End definition for \@footnotemark.)

\footnotetext

535 \def\footnotetext{%
536   \@ifnextchar [\@xfootnotenext
537     {\protected@xdef\@thefnmark{\thempfn}%
538     \@footnotetext}}

(End definition for \footnotetext.)

\@xfootnotenext

539 \def\@xfootnotenext[#1]{%
540   \begingroup
541     \csname c@\@mpfn\endcsname #1\relax
542     \unrestored@protected@xdef\@thefnmark{\thempfn}%
543   \endgroup
544   \@footnotetext}

(End definition for \@xfootnotenext.)

\thempfn
\@mpfn
545 \def\@mpfn{footnote}
546 \def\thempfn{\thefootnote}

(End definition for \thempfn and \@mpfn.)

```

`\footref` This command generates a footnote mark. The value is produced by referencing a `\label` placed into a `\footnote` elsewhere (can be one in the main galley or in a minipage).

```

547 </2ekernel>
548 <*2ekernel | latexrelease>
549 <latexrelease>\IncludeInRelease{2021/06/01}%
550 <latexrelease>                {\footref}{Add footref}%
551 \def\footref#1{%
552   \begingroup
553     \unrestored@protected@xdef\@thefnmark{\ref{#1}}%
554   \endgroup
555   \@footnotemark
556 }
557 </2ekernel | latexrelease>
558 <latexrelease>\EndIncludeInRelease

```

We don't remove it when rolling back so that packages offered it in the past do not need to alter their behavior in a rollback situation.

```

559 <latexrelease>\IncludeInRelease{0000/00/00}%
560 <latexrelease>                {\footref}{Add footref}%
561 <latexrelease>
562 <latexrelease> % \let\footref\@undefined
563 <latexrelease>
564 <latexrelease>\EndIncludeInRelease
565 <*2ekernel>

```

*(End definition for \footref.)*

```

566 </2ekernel>

```

# File Q

## ltidxglo.dtx

### 1 Index and Glossary Generation

Index and Glossary commands.

```

\makeindex      A preamble command to turn on indexing.
\makeglossary   A preamble command to turn on making glossary entries.
  \index        Make an index entry for #1.
  \glossary     Make a glossary entry for #1.
Historical LATEX 2.09 comments (not necessarily accurate any more):
\makeindex ==
  BEGIN
    \index == BEGIN \@bsphack
              \begingroup
              \protect{X} == \string X\space
              %% added 3 Feb 87 for \index commands
              %% in \footnotes
              re-\catcode special characters
              to 'other'
              \@wrindex

  END

\@wrindex{ITEM} ==
  BEGIN
    write of {\indexentry{ITEM}{page number}}
  \endgroup
  \@esphack
  END

INITIALIZATION:

\index == BEGIN \@bsphack
          \begingroup
          re-\catcode special characters (in case '%' there)
          \@index

  END

\@index{ITEM} == BEGIN \endgroup \@esphack END

```

Changes made 14 Apr 89 to write \glossaryentry's instead of  
\indexentry's on the .glo file.

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

```

1 <*2ekernel>
2 \message{index,}

```

`\makeindex`

```
3 \def\makeindex{%
4   \newwrite\@indexfile
5   \immediate\openout\@indexfile=\jobname.idx
6   \def\index{\@bsphack\begingroup
7     \@sanitize
8     \@windex}\typeout
9     {Writing index file \jobname.idx}}%
```

Opening the write channel should be done only once since on some OS multiple opens are forbidden and in any case it is useless. So we turn this into a no-op after use.

```
10 \let\makeindex\@empty
11 }
12 \@onlypreamble\makeindex
```

*(End definition for \makeindex.)*

`\@windex`

```
13 \def\@windex#1{%
14   \protected@write\@indexfile{%
15     {\string\indexentry{#1}{\thepage}}%
16   \endgroup
17   \@esphack}
```

*(End definition for \@windex.)*

`\index`

```
18 \def\index{\@bsphack\begingroup \@sanitize\@index}
```

*(End definition for \index.)*

`\@index`

```
19 \def\@index#1{\endgroup\@esphack}
```

*(End definition for \@index.)*

`\makeglossary`

```
20 \def\makeglossary{%
21   \newwrite\@glossaryfile
22   \immediate\openout\@glossaryfile=\jobname.glo
23   \def\glossary{\@bsphack\begingroup
24     \@sanitize
25     \@wrglossary}\typeout
26     {Writing glossary file \jobname.glo }}%
```

Opening the write channel should be done only once since on some OS multiple opens are forbidden and in any case it is useless. So we turn this into a no-op after use.

```
27 \let\makeglossary\@empty
28 }
29 \@onlypreamble\makeglossary
```

*(End definition for \makeglossary.)*



`\@wrglossary`

```
30 \def\@wrglossary#1{%  
31   \protected@write\@glossaryfile{%  
32     {\string\glossaryentry{#1}{\thepage}}%  
33   \endgroup  
34   \@esphack}
```

*(End definition for \@wrglossary.)*

`\glossary`

```
35 \def\glossary{\@bsphack\begingroup\@sanitize\@index}
```

*(End definition for \glossary.)*

```
36 \</2kernel>
```

# File R

## ltbibl.dtx

### 1 Bibliography Generation

A bibliography is created by the `thebibliography` environment, which generates a title such as “References”, and a list of entries. The `BIBTEX` program will create a file containing such an environment, which will be read in by the `\bibliography` command. With `BIBTEX`, the following commands will be used.

`\bibliography`      `\bibliography{<file1,file2, ...,filen>}` : specifies the bibdata files. Writes a `\bibdata` entry on the `.aux` file and tries to read in `mainfile.bbl`.

`\bibliographystyle`      `\bibliographystyle{<style>}` : Writes a `\bibstyle` entry on the `.aux` file.

`thebibliography (env.)`      The `thebibliography` environment is a list environment. To save the use of an extra counter, it should use `enumiv` as the item counter. Instead of using `\item`, items in the bibliography are produced by the following commands:

`\bibitem{<name>}` : Produces a numbered entry cited as `<name>`.

`\bibitem[<label>]{<name>}` : Produces an entry labeled by `<Label>` and cited by `<name>`.

The former is used for bibliographies with citations like [1], [2], etc.; the latter is used for citations like [Knuth82].

The document class must define the `thebibliography` environment. This environment has a single argument, which is the widest bibliography label— e.g., if the [Knuth67] is the widest entry, then this argument will be Knuth67. The `\thebibliography` command must begin a list environment, which the `\endthebibliography` command ends.

`\cite`      Entries are cited by the command `\cite{<name>}`.

`\nocite`      `\nocite{<citations>}` puts information on the `.aux` file that causes `BIBTEX` to include the `{<citations>}` list in the bibliography, but puts nothing in the text.

`\nocite{*}` is special: it tells `BIBTEX` to put the whole of a collection of references into the bibliography.

```
1 <*2ekernel>
2 \message{bibliography,}
```

*Historical `ETEX` 2.09 comments (not necessarily accurate any more):*

#### PARAMETERS

`@cite` : A macro such that `\@cite{LABEL1,LABEL2}{NOTE}` produces the output for a `\cite[NOTE]{FOO1,FOO2}` command, where entry `FOOi` is defined by `\bibitem[LABELi]{FOOi}`. The switch `@tempswa` is true if the optional `NOTE` argument is present.

The default definition is :

```
\@cite{LABELS}{NOTE} ==
  BEGIN [LABELS
    IF @tempswa = T THEN , NOTE FI
  ]
END
```

`@biblabel` : A macro to produce the label in the bibliography entry. For `\bibitem[LABEL]{NAME}`, the label is

generated by \@biblabel{LABEL}. It has the default definition \@biblabel{LABEL} -> [LABEL].

#### CONVENTION

\b@F00 : The name or number of the reference created by \cite{FOO}  
E.g., if \cite{FOO} -> [17] , then \b@F00 -> 17.

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

\bibitem

```
3 \def\bibitem{\@ifnextchar[\@lbibitem\@bibitem}
```

*(End definition for \bibitem.)*

\@lbibitem

```
4 \def\@lbibitem[#1]#2{\item[\@biblabel{#1}\hfill]\if@filesw
5     {\let\protect\noexpand
6      \immediate
7      \write\@auxout{\string\bibcite{#2}{#1}}}\fi\ignorespaces}
```

*(End definition for \@lbibitem.)*

\@bibitem

```
8 \def\@bibitem#1{\item\if@filesw \immediate\write\@auxout
9     {\string\bibcite{#1}{\the\value{\@listctr}}}\fi\ignorespaces}
```

*(End definition for \@bibitem.)*

\bibcite

```
10 \def\bibcite{\@newlabel\b@b}
```

*(End definition for \bibcite.)*

\citation

```
11 \let\citation\@gobble
```

*(End definition for \citation.)*

\cite

```
12 \</2ekernel>
13 \< *2ekernel | latexrelease>
14 \< latexrelease>\IncludeInRelease{2022/06/01}%
15 \< latexrelease> \cite}{check for blank}%
16 \DeclareRobustCommand\cite{%
17     \@ifnextchar [{\@tempswatrue\@citex@checkblank}{\@tempswafalse\@citex@checkblank[]}]}
```

Due to the way \@for as used in \@citex behaves an empty argument to \cite did not produce any warning for a missing citation. So we now inject a command before calling \@citex that does the checking for us. It is not done in \@citex directly, because that command is altered by a number of packages/classes and this way it is more likely that the check survives.

```
18 \def\@citex@checkblank[#1]#2{%
19     \IfBlankTF {#2}%
20     {\@citex[#1]{\space}}%
21     {\@citex[#1]{#2}}%
22 }
23 \</2ekernel | latexrelease>
```

```

24 <latexrelease>\EndIncludeInRelease
25 <latexrelease>\IncludeInRelease{0000/00/00}%
26 <latexrelease>          {\cite}{check for blank}%
27 <latexrelease>
28 <latexrelease>\DeclareRobustCommand\cite{%
29 <latexrelease> \ifnextchar [{\@tempswatrue\@citex}{\@tempswafalse\@citex[]}}
30 <latexrelease>\let\@citex@checkblank\@undefined
31 <latexrelease>
32 <latexrelease>\EndIncludeInRelease
33 <*2ekernel>

```

(End definition for \cite.)

\@citex \penalty\@m added to definition of \@citex to allow a line break after the ‘,’ in citations like [Jones80,Smith77] (Added 23 Oct 86)  
space added after the ‘,’ (21 Nov 87)

```

34 \def\@citex[#1]#2{\leavevmode
35   \let\@citea\@empty
36   \@cite{\@for\@citeb:=#2\do
37     {\@citea\def\@citea{,\penalty\@m\ }%
38     \edef\@citeb{\expandafter\@firstofone\@citeb\@empty}}%
39   \if@filesw\immediate\write\@auxout{\string\citation{\@citeb}}\fi

```

Using \hbox instead of \mbox is fine because of the \leavevmode above. In fact the use of a box around the citation contents is more than questionable in my view (FMi), but within 2e I have to keep that for compatibility reasons as it would probably change too many existing documents. Its main reason is to avoid hyphenation of labels such as [FOOB89] into [FOO- B89] so in certain styles it makes sense; but, for example, in author year citations it becomes more than questionable.

So Chris added yet another hook here, as suggested by, at least, Donald Arseneau. Note that this one is inside the first argument of the \@cite hook. This decouples the top-level typesetting of the citation from the details of the other business conducted here. All this really needs a complete rethink to get the right modularity.

```

40   \ifundefined{b@\@citeb}{\hbox{\reset@font\bfseries ?}}%
41   \G@refundefinedtrue
42   \@latex@warning
43     {Citation ‘\@citeb’ on page \thepage \space undefined}}%
44   {\@cite@ofmt{\csname b@\@citeb\endcsname}}}{#1}}

```

(End definition for \@citex.)

```

\@bibdata
\@bibstyle
45 \let\@bibdata=\@gobble
46 \let\@bibstyle=\@gobble

```

(End definition for \bibdata and \bibstyle.)

```

\bibliography
47 \def\bibliography#1{%
48   \if@filesw
49     \immediate\write\@auxout{\string\bibdata{\zap@space#1 \@empty}}%
50   \fi
51   \@input{\jobname.bbl}}

```

(End definition for \bibliography.)

\bibliographystyle

```
52 \def\bibliographystyle#1{%  
53   \ifx\@begindocumenthook\@undefined\else  
54     \expandafter\AtBeginDocument  
55   \fi  
56   {\if@filesw  
57     \immediate\write\@auxout{\string\bibstyle{#1}}%  
58   \fi}}
```

(End definition for \bibliographystyle.)

\nocite (Added 14 Jun 85)

This puts information on the .aux file that causes BibTeX to include the citation list in the bibliography, but puts nothing in the text.

RmS 93/08/06: Made loop for \nocite like that for \@citex, to get rid of leading spaces.

```
59 \</2ekernel>  
60 \<*2ekernel | latexrelease>  
61 \<latexrelease>\IncludeInRelease{2021/06/01}%  
62 \<latexrelease>          {\nocite}{Allow nocite in preamble}%  
63 \def\nocite#1{\@bsphack
```

With the implementation designed already in L<sup>A</sup>T<sub>E</sub>X 2.09 the \nocite command will not work before \begin{document} since it tries to write to the .aux file which is not open before that point. As a result the “reference” will appear on the terminal and nothing else will happen.

[This would be easy to fix, but then a document using the fix will silently fail on an older release of L<sup>A</sup>T<sub>E</sub>X, missing all citations done with \nocite. Thus we do only generate an error message and leave the fix for a L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> successor.]

Given that we are now a quarter century into using L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> there is no good reason any more do limit ourself to 2.09 considerations. So we now simply delay the \nocite if it is issued in the preamble.

```
64   \ifx\@onlypreamble\document
```

Since we are after \begin{document} we can do the citations:

```
65   \@for\@citeb:=#1\do{%  
66     \edef\@citeb{\expandafter\@firstofone\@citeb}%  
67     \if@filesw\immediate\write\@auxout{\string\citation{\@citeb}}\fi  
68     \ifundefined{b@\@citeb}{\G@refundefinedtrue  
69       \latex@warning{Citation ‘\@citeb’ undefined}}{}}%  
70   \else
```

But before \begin{document} we raised an error message in the past but as of 2021/05 not any longer.

```
71 %   \latex@error{Cannot be used in preamble}\@eha
```

Instead we delay the declaration to the start of the document. We have to use a late hook for this, so that it comes after the .aux file is open for writing and after \@preamblecmds was executed to change the above test. Therefore \AtBeginDocument would still be too early.

```
72   \AddToHook{begindocument/end}[kernel]{\nocite{#1}}%  
73   \fi
```

```

74 \esphack}
75 </2ekernel | latexrelease>
76 <latexrelease>\EndIncludeInRelease

77 <latexrelease>\IncludeInRelease{0000/00/00}%
78 <latexrelease> \nocite}{Allow nocite in preamble}%
79 <latexrelease>
80 <latexrelease>\def\nocite#1{\@bsphack
81 <latexrelease> \ifx\@onlypreamble\document
82 <latexrelease> \for\@citeb:=#1\do{%
83 <latexrelease> \edef\@citeb{\expandafter\@firstofone\@citeb}%
84 <latexrelease> \if@filesw\immediate\write\@auxout{\string\citation{\@citeb}}\fi
85 <latexrelease> \ifundefined{b@\@citeb}{\G@refundefinedtrue
86 <latexrelease> \@latex@warning{Citation ‘\@citeb’ undefined}}{}}%
87 <latexrelease> \else
88 <latexrelease> \@latex@error{Cannot be used in preamble}\@eha
89 <latexrelease> \fi
90 <latexrelease> \esphack}
91 <latexrelease>
92 <latexrelease>\EndIncludeInRelease
93 <*2ekernel>

```

Since `\nocite{*}` should not produce a warning about undefined citation keys (see PR 557), we need to set the control sequence ‘`b@*`’ to something other than `\relax`. As a result `\cite{*}` will not warn either (but that never worked with BibTeX in the first place).

```

94 \expandafter\let\csname b@*\endcsname\@empty

```

(End definition for `\nocite`.)

## 1.1 Default definitions

This hook determines the ‘relative formatting’ of the two logical parts of a citation with comment.

```

\@cite
95 \def\@cite#1#2{[#1\if@tempswa , #2\fi]}

```

(End definition for `\@cite`.)

`\@cite@ofmt` This is, in general, a command that appears to have one argument whose value is, in the kernel, a single cs whose name is the expansion of `b@\@citeb`; the expansion of this cs will typically be some hmode material that produces the detailed typeset form of just the citations themselves.

```

96 \let\@cite@ofmt\hbox

```

(End definition for `\@cite@ofmt`.)

```

\@biblabel
97 \def\@biblabel#1{[#1]}
98 </2ekernel>

```

(End definition for `\@biblabel`.)

# File S

## ltmarks.dtx

### Abstract

Marks are used to communicate information about the content of a page to the output routine. For example, in order to construct running headers, the output routine needs information about which section names are present on a page, and this information is passed to it through the mark system. However, marks may also be used for other purposes. This module provides a generalized mechanism for marks of independent classes.

## 1 Introduction

The  $\text{T}_{\text{E}}\text{X}$  engines offer a low-level mark mechanism to communicate information about the content of the current page to the asynchronous operating output routine. It works by placing `\mark` commands into the source document. When the material for the current page is assembled in box 255,  $\text{T}_{\text{E}}\text{X}$  scans for such marks and sets the commands `\topmark`, `\firstmark` and `\botmark`. The `\firstmark` receives the content of the first `\mark` seen in box 255 and `\botmark` the content of the last mark seen. The `\topmark` holds the content of the last mark seen on the previous page or more exactly the value of `\botmark` from the previous page. If there are no marks on the current page then all three are made equal to the `\botmark` from the previous page.

This mechanism works well for simple formats (such as plain  $\text{T}_{\text{E}}\text{X}$ ) whose output routines are only called to generate pages. It fails, however, in  $\text{\LaTeX}$  (and other more complex formats), because here the output routine is sometimes called without producing a page, e.g., when encountering a float and placing it into one of the float regions. In that case the output routine is called, determines where to place the float, alters the goal for assembling text material (if the float was added to the top or bottom region) and then it resumes collecting textual material.

As a result the `\botmark` gets updated and so `\topmark` no longer reflects the situation at the top of the next page when that page is finally boxed.

Another problem for  $\text{\LaTeX}$  was that it wanted to use several “independent” marks and in the early implementations of  $\text{T}_{\text{E}}\text{X}$  there was only a single `\mark` command available. For that reason  $\text{\LaTeX}$  implemented its own mark mechanism where the marks always contained two parts with their own interfaces: `\markboth` and `\markright` to set marks and `\leftmark` and `\rightmark` to retrieve them.

However, this extended mechanism (while supporting scenarios such as chapter/section marks) was far from general. The mark situation at the top of a page (i.e., `\topmark`) remained unusable and the two marks offered were not really independent of each other because `\markboth` (as the name indicates) was always setting both.

The new mechanism overcomes both issues:

- It provides arbitrarily many, fully independent named marks, that can be allocated and, from that point onwards, used.
- It offers access for each such marks to retrieve its top, first, and bottom values separately.
- Furthermore, the mechanism is augmented to give access to marks in different “regions” which may not be just full pages.

## 2 Design-level and code-level interfaces

The interfaces are mainly meant for package developers, but they are usable (with appropriate care) also in the document preamble, for example, when setting up special running headers with `fancyhdr`, etc. They are therefore available both as CamelCase commands as well as commands for use in the L3 programming layer. Both are described together below.

---

<code>\NewMarkClass</code>	<code>\NewMarkClass {&lt;class&gt;}</code>
<code>\mark_new_class:n</code>	<code>\mark_new_class:n {&lt;class&gt;}</code>

---

Declares a new `<class>` of marks to be tracked by L<sup>A</sup>T<sub>E</sub>X. Each `<class>` must be declared before it is used.

Mark classes can only be declared before `\begin{document}`.

---

<code>\InsertMark</code>	<code>\InsertMark {&lt;class&gt;} {&lt;text&gt;}</code>
<code>\mark_insert:nn</code>	<code>\mark_insert:nn {&lt;class&gt;} {&lt;text&gt;}</code>

---

Adds a mark to the current galley for the `<class>`, containing the `<text>`.

It has no effect in places in which you can't place floats, e.g., a mark inside a box or inside a footnote never shows up anywhere.

If used in vertical mode it obeys L<sup>A</sup>T<sub>E</sub>X's internal `\@nobreak` switch, i.e., it does not introduce a breakpoint if used after a heading. If used in horizontal mode it doesn't handle spacing (like, for example, `\index` or `\label` does, so it should be attached to material that is typeset.

---

<code>insertmark</code>	<code>\AddToHook {insertmark} {&lt;code&gt;}</code>
-------------------------	---

---

When marks are inserted, the mark content may need some special treatment, e.g., by default `\label`, `\index`, and `\glossary` do not expand at this time (but only later if and when the mark content is actually used. In order to allow packages to augment or alter this setup there is a public hook `insertmark` that is executed at this point. It runs in a group so local modification to commands are only applied to the `<text>` argument of `\InsertMark` or `\mark_insert:nn`.



---

<code>\TopMark</code>	<code>* \TopMark</code>	<code>[\langle region \rangle] {\langle class \rangle}</code>
<code>\FirstMark</code>	<code>* \FirstMark</code>	<code>[\langle region \rangle] {\langle class \rangle}</code>
<code>\LastMark</code>	<code>* \LastMark</code>	<code>[\langle region \rangle] {\langle class \rangle}</code>
<code>\mark_use_top:nn</code>	<code>* \mark_use_top:nn</code>	<code>{\langle region \rangle} {\langle class \rangle}</code>
<code>\mark_use_first:nn</code>	<code>* \mark_use_first:nn</code>	<code>{\langle region \rangle} {\langle class \rangle}</code>
<code>\mark_use_last:nn</code>	<code>* \mark_use_last:nn</code>	<code>{\langle region \rangle} {\langle class \rangle}</code>

---

These functions expand to the appropriate mark  $\langle text \rangle$  for the given  $\langle class \rangle$  in the specified  $\langle region \rangle$ . The default  $\langle region \rangle$  in the design-level commands is `page`. Note that with the L3 layer commands there are no optional arguments, i.e., both arguments have to be provided.

**TeXhackers note:** The result is returned within the `\unexpanded` primitive (`\exp_not:n`), which means that the  $\langle text \rangle$  does not expand further when appearing in an `x`-type or `e`-type argument expansion.

The “first” and “last” marks are those seen first and last in the current region/page, respectively. The “top” mark is the last mark of the  $\langle class \rangle$  seen in an earlier region, i.e., the  $\langle text \rangle$  what would be “current” at the very top of the region.

### Important!

The commands are only meaningful inside the output routine, in other places their result is (while not random) unpredictable due to the way L<sup>A</sup>T<sub>E</sub>X cuts text material into pages.

Currently,  $\langle region \rangle$  is one of `page`, `previous-page`, `column`, and `previous-column`. If a page has just been finished then the region `page` refers to the current page and `previous-page`, as the name indicates, to the page that has been finished previously. This means you are able to access mark information for the current page as well as for the page before if you are inside the output routine, without the need to explicitly save that information beforehand.

In single column documents the `column` is the same as the `page` region, but in two-column documents, `column` refers to the current column that just got finished and `previous-column` to the one previously finished. Code for running headers are (in standard L<sup>A</sup>T<sub>E</sub>X) only evaluated when both columns are assembled, which is another way of saying that in that case `previous-column` refers to the left column and `column` to the right column. However, to make this a bit nicer to access, there are also alias regions named `first-column` and `last-column`<sup>32</sup> to access these regions.<sup>33</sup>

Note that you can only look backwards at already processed regions, e.g., in a `twoside` document finishing a recto (odd, right-hand) page you can access the data from the facing verso (left-hand) page, but if you are finishing a left-hand page you can’t integrate data from the upcoming right-hand page. If such a scenario needs to be realized then it is necessary to save the left-hand page temporarily instead of finalizing it, process material for the right-hand page and once both are ready, attach running headers and footers and shipout out both in one go.<sup>34</sup>

---

<sup>32</sup>This is called “last” not “second” in anticipation of extending the mechanism to multiple columns, where first and last would still make sense.

<sup>33</sup>At the moment there aren’t any `previous-...-column` regions to access the columns from the previous page. If necessary, the mechanism could be easily augmented to cover them too, though.

<sup>34</sup>As of now that scenario is not yet officially supported.

---

<code>\IfMarksEqualTF</code>	★	<code>\IfMarksEqualTF</code>	<code>[\langle region \rangle] {\langle class \rangle} {\langle pos_1 \rangle} {\langle pos_2 \rangle} {\langle true \rangle} {\langle false \rangle}</code>
<code>\mark_if_eq:nnnnTF</code>	★	<code>\mark_if_eq:nnnnTF</code>	<code>{\langle region \rangle} {\langle class \rangle} {\langle pos_1 \rangle} {\langle pos_2 \rangle} {\langle true \rangle} {\langle false \rangle}</code>
<code>\mark_if_eq:nnnnnnTF</code>	★	<code>\mark_if_eq:nnnnnnTF</code>	<code>{\langle region_1 \rangle} {\langle class_1 \rangle} {\langle pos_1 \rangle}</code> <code>{\langle region_2 \rangle} {\langle class_2 \rangle} {\langle pos_2 \rangle} {\langle true \rangle} {\langle false \rangle}</code>

---

These conditionals allow you to compare the content of two marks and act based on the result. The commands work in an expansion context, if necessary.

It is quite common when programming with marks to need to interrogate conditions such as whether marks have appeared on a previous page, or if there are multiple marks present on the current page, and so on. The tests above allow for the construction of a variety of typical test scenarios, with three examples presented below.

The first two conditionals cover only the common scenarios. Both marks are picked up from the same *region* (by default `page`) and they have to be of the same *class*.<sup>35</sup> The *pos<sub>i</sub>* argument can be either `top`, `first`, or `last`.

If you wish to compare marks across different regions or across different classes, you have to do it using the generic test only available in the L3 programming layer or do it manually, i.e., get the marks and then compare the values yourself.<sup>36</sup>

However, the basic version is enough for the following typical use cases:

**Test for at most one mark of class `myclass` on current page:** If the first and last mark in a region are the same then either there was no mark at all, or there was at most one. To test this on the current page:

```
\NewMarkClass{myclass}
\IfMarksEqualTF{myclass}{first}{last}
{ <zero or one mark> }{ <two or more marks> }
```

**Test for no mark of class `myclass` in the previous page:** If the top mark is the same as the first mark, there is no mark in the region at all. If we wanted to do this test for the previous page:

```
\IfMarksEqualTF[previous-page]{myclass}{top}{first}
{ <no marks> }{ <at least one mark> }
```

Comparing `top` and `last` would give you the same result.

**Test for zero, one, or more than one:** Combining the two tests from above you can test for zero, one or more than one mark.

```
\IfMarksEqualTF{myclass}{top}{first}
{ <no marks> }
{\IfMarksEqualTF{myclass}{first}{last}
{ <exactly one mark> }{ <more than one mark> }}
```

If you need one of such tests more often (or if you want a separate command for it for readability), then consider defining:

```
\providecommand\IfNoMarkTF[2][page]{\IfMarksEqualTF[#1]{#2}{first}{last}}
```

---

<sup>35</sup>If an undeclared mark class is used the tests return *true* (not an error).

<sup>36</sup>If two undeclared mark classes are compared the result is always *true*; if a declared and an undeclared mark class is used it is always *false*.

## 2.1 Debugging mark code

---

<code>\DebugMarksOn</code>	<code>\DebugMarksOn ...</code>	<code>\DebugMarksOff</code>
<code>\DebugMarksOff</code>		
<code>\mark_debug_on:</code>	Commands to turn the debugging of mark code on or off. The debugging output is	
<code>\mark_debug_off:</code>	rather coarse and not really intended for normal use at this point in time.	

---

## 3 Application examples

If you want to figure out if a break was taken at a specific point, e.g., whether a heading appears at the top of the page, you can do something like this:

```
\newcounter{breakcounter}
\NewMarkClass{break}
\newcommand\markedbreak[1]{\stepcounter{breakcounter}%
                           \InsertMark{break}{\arabic{breakcounter}}%
                           \penalty #1\relax
                           \InsertMark{break}{-\arabic{breakcounter}}}
```

To test if the break was taken you can test if `\TopMark{break}` is positive (taken) or negative (not taken) or zero (there was never any marked break so far). The absolute value can be used to keep track of which break it was (with some further coding).

*to be extended with additional application examples*

## 4 Legacy L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> interface

Here we describe the interfaces that L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> offered since the early nineties and some minor extensions.

### 4.1 Legacy design-level and document-level interfaces

---

<code>\markboth</code>	<code>\markboth</code>	<code>{\left}} {\right}}</code>
<code>\markright</code>	<code>\markright</code>	<code>{\right}}</code>

---

L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> uses two marks which aren't fully independent. A “left” mark generated by the first argument of `\markboth` and a “right” mark generated by the second argument of `\markboth` or by the only argument of `\markright`. The command `\markboth` and `\markright` are in turn called from heading commands such as `\chaptermark` or `\sectionmark` and their behavior is controlled by the document class.

For example, in the `article` class with `twoside` in force the `\sectionmark` will issue `\markboth` with an empty second argument and `\subsectionmark` will issue `\markright`. As a result the left mark will contain chapter titles and the right mark subsection titles.

Note, however, that in one-sided documents the standard behavior is that only `\markright` is used, i.e., there will only be right-marks but no left marks!

---

```
\leftmark * \leftmark
\rightmark * \rightmark
```

---

These functions return the appropriate mark value from the current page and work as before, that is `\leftmark` will get the last (!) left mark from the page and `\rightmark` the first (!) right mark.

In other words they work reasonably well if you want to show the section title that is current when you are about to turn the page and also show the first subsection title on the current page (or the last from the previous page if there wasn't one). Other combinations can't be shown using this interface.

The commands are fully expandable, because this is how they have been always defined in  $\text{\LaTeX}$ . However, this is of course only true if the content of the mark they return is itself expandable and does not contain any fragile material. Given that this can't be guaranteed for arbitrary content, a programmer using them in this way should use `\protected@edef` and *not* `\edef` to avoid bad surprises as far as this is possible, or use the new interfaces (`\TopMark`, `\FirstMark`, and `\LastMark`) which return the  $\langle text \rangle$  in `\exp_not:n` to prevent uncontrolled expansion.

## 4.2 Legacy interface extensions

The new implementation adds three mark classes: `2e-left`, `2e-right` and `2e-right-nonempty` and patches `\markboth` and `\markright` slightly so that they also update these new mark classes, so that the new classes work with existing document classes.

As a result you can use `\LastMark{2e-left}` and `\FirstMark{2e-right}` instead of `\leftmark` and `\rightmark`. But more importantly, you can use any of the other retrieval commands to get a different status value from those marks, e.g., `\LastMark{2e-right}` would return the last subsection on the page (instead of the first as returned by `\rightmark`).

The difference between `2e-right` and `2e-right-nonempty` is that the latter will only be updated if the material for the mark is not empty. Thus `\markboth{title}{}` as issued by, say, `\sectionmark`, sets a `2e-left` mark with `title` and a `2e-right` mark with the empty string but does not add a `2e-right-nonempty` mark.

Thus, if you have a section at the start of a page and you would ask for `\FirstMark{2e-right}` you would get an empty string even if there are subsections on that page. But `2e-right-nonempty` would then give you the first or last subsection on that page. Of course, nothing is simple. If there are no subsections it would tell you the last subsection from an earlier page. We therefore need comparison tools, e.g., if top and first are identical you know that the value is bogus, i.e., a suitable implementation would be

```
\IfMarksEqualTF{2e-right-nonempty}{top}{first}
{ <appropriate action if there was no real mark> }
{\FirstMark{2e-right-nonempty}}
```

## 5 Notes on the mechanism

In contrast to vanilla  $\text{\TeX}$ ,  $\varepsilon\text{-}\text{\TeX}$  extends the mark system to allow multiple independent marks. However, it does not solve the `\topmark` problem which means that  $\text{\LaTeX}$  still needs to manage marks almost independently of  $\text{\TeX}$ . The reason for this is that the more complex output routine used by  $\text{\LaTeX}$  to handle floats (and related structures)

means that `\topmark(s)` remain unreliable. Each time the output routine is fired up,  $\text{\TeX}$  moves `\botmark` to `\topmark`, and while  $\varepsilon\text{-}\text{\TeX}$  extends this to multiple registers the fundamental concept remains the same. That means that the state of marks needs to be tracked by  $\text{\LaTeX}$  itself. An early implementation of this package used  $\text{\TeX}$ 's `\botmark` only to ensure the correct interaction with the output routine (this was before the  $\varepsilon\text{-}\text{\TeX}$  mechanism was even available). However, other than in a prototype implementation for  $\text{\LaTeX}3$ , this package was never made public.

The new implementation now uses  $\varepsilon\text{-}\text{\TeX}$ 's marks as they have some advantages, because with them we can leave the mark text within the galley and only extract the marks during the output routine when we are finally shipping out a page or storing away a column for use in the next page. That means we do not have to maintain a global data structure that we have to keep in sync with informational marks in the galley but can rely on everything being in one place and thus manipulations (e.g. reordering of material) will take the marks with them without a need for updating a fragile linkage.

To allow for completely independent marks we use the following procedure:

- For every type of marks we allocate a mark class so that in the output routine  $\text{\TeX}$  can calculate for each class the current top, first, and bottom mark independently. For this we use `\newmarks`, i.e., one marks register per class.
- As already mentioned firing up an output routine without shipping out a page means that  $\text{\TeX}$ 's top marks get wrong so it is impossible to rely on  $\text{\TeX}$ 's approach directly. What we do instead is to keep track of the real marks (for the last page or more generally last region) in some global variables.
- These variables are updated in the output routine at defined places, i.e., when we do real output processing but not if we use special output routines to do internal housekeeping.
- The trick we use to get correctly updated variables is the following: the material that contains new marks (for example the page to be shipped out) is stored in a box. We then use  $\text{\TeX}$  primitive box splitting functions by splitting off the largest amount possible (which should be the whole box if nothing goes really wrong). While that seems a rather pointless thing to do, it has one important side effect:  $\text{\TeX}$  sets up first and bottom marks for each mark class from the material it has split off. This way we get the first and last marks (if there have been any) from the material in the box.
- The top marks are simply the last marks from the previous page or region. And if there hasn't been a first or bottom mark in the box then the new top mark also becomes new first and last mark for that class.
- That mark data is then stored in global token lists for use during the output routine and legacy commands such as `\leftmark` or new commands such as `\TopMark` simply access the data stored in these token lists.

That's about it in a nutshell. Of course, there are some details to be taken care of—those are discussed in the implementation sections.

## 6 Internal output routine functions

The functions in this section are tied to the output routine and used in the interface to L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> and perhaps at some later time within a new output routine for L<sup>A</sup>T<sub>E</sub>X. They are not meant for general use and are therefore made internal. Internal means that @@ automatically gets replaced in the code (and in the documentation) so we have to give it a suitable value.

1 <@@=mark>

---

**\\_mark\\_update\\_singlecol\\_structures:** \\_mark\\_update\\_singlecol\\_structures:

---

L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> integration function in case we are doing single column layouts. It assumes that the page content is already stored in \@outputbox and processes the marks inside that box. It is called as part of \@opcol.

---

**\\_mark\\_update\\_dblcol\\_structures:** \\_mark\\_update\\_singlecol\\_structures:

---

L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> integration function mark used when we are doing double column documents. It assumes that the page content is already stored in \@outputbox and processes the marks inside that box. It then does different post-processing depending on the start of the switch \if@firstcolumn. If we are in the second column it also has to update page marks, otherwise it only updates column marks. It too is called as part of \@opcol.

---

**\\_mark\\_update\\_structure:nn** \\_mark\\_update\\_structure:nn <{region}> <{material with marks}>

---

Helper function that inspects the marks inside the second argument and assigns new mark values based on that to the <region> given in the first argument. For this it first copies the mark structure from <region> to previous-<region> and then takes all last mark values currently in the region and makes them the new top mark values. Finally it assigns new first and last values for all mark classes based on what was found in the second argument.

As a consequence, the allowed values for <region> are page and column because only they have previous-... counterparts.

Another important part to keep in mind is that marks are only recognized if they appear on top-level, e.g., if we want to process material stored in boxes we need to put it unboxed (using \unvcopy etc.) into the second argument.

---

**\\_mark\\_update\\_structure\\_alias:nn** \\_mark\\_update\\_structure\\_alias:nn <{alias}> <{source}>

---

Helper function that copies all mark values in the <source> region to <alias>, i.e., make the structures identical. Used to update the previous-... structures inside \\_mark\\_update\\_structure:nn and first-column and last-column structures inside \\_mark\\_update\\_singlecol\\_structures: or \\_mark\\_update\\_dblcol\\_structures:.

---

**\\_mark\\_update\\_structure\\_to\\_err:n** \\_mark\\_update\\_structure\\_to\\_err:n <{region}>

---

Helper function that sets all mark values in the <region> to an error message. This is currently used for last-column at times where using marks from it would be questionable/wrong, i.e., when we have just processed the first column in a two-column document.

## 7 The Implementation

```

2 <*2ekernel | latexrelease>
3 \ExplSyntaxOn
4 <latexrelease>\NewModuleRelease{2022/06/01}{ltmarks}
5 <latexrelease>                {Marks-handling}

```

### 7.1 Allocating new mark classes

---

`\g__mark_classes_seq` A list holding all the mark classes that have been declared.

```

6 \seq_new:N \g__mark_classes_seq

```

`\mark_new_class:n` A mark class is created by initializing a number of data structures. First, we get a register number to refer to the mark class. The new mark class is then added to the `\g__mark_classes_seq` sequence to be able to easily loop over all classes. Finally a number of top-level global token lists are declared that hold various versions of the mark for access.

`\__mark_new_class:nn`

```

7 \cs_new_protected:Npn \mark_new_class:n #1
8 {
9   \seq_if_in:NnTF \g__mark_classes_seq {#1}
10     {
11       \msg_error:nnn { mark } { class-already-defined }
12         {#1}
13     }
14     { \__mark_new_class:nn {#1} }
15 }

```

This is only available in the preamble.

```

16 \@onlypreamble \mark_new_class:n

```

The internal command carries out the necessary allocations.

```

17 \cs_new_protected:Npn \__mark_new_class:nn #1
18 {
19   <*trace>
20   \__mark_debug:n { \iow_term:x { Marks:~new~mark:~#1~\msg_line_context: } }
21   </trace>

```

Use the L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> interface for now as the L3 programming layer doesn't have one for marks yet.

```

22 \exp_args:Nc \newmarks {c__mark_class_ #1 _mark}

```

Remember the new class in the sequence.

```

23 \seq_gput_right:Nn \g__mark_classes_seq {#1}

```

We need three token lists for each region, one for top, first, and last.

```

24 \tl_new:c { g__mark_page_top_ #1 _tl }
25 \tl_new:c { g__mark_page_first_ #1 _tl }
26 \tl_new:c { g__mark_page_last_ #1 _tl }

```

For the page region we also keep track of the previous-page.

```

27 \tl_new:c { g__mark_previous-page_top_ #1 _tl }
28 \tl_new:c { g__mark_previous-page_first_ #1 _tl }
29 \tl_new:c { g__mark_previous-page_last_ #1 _tl }

```

Same game for column and previous-column

```

30 \tl_new:c { g__mark_column_top_ #1 _tl }
31 \tl_new:c { g__mark_column_first_ #1 _tl }
32 \tl_new:c { g__mark_column_last_ #1 _tl }
33 \tl_new:c { g__mark_previous-column_top_ #1 _tl }
34 \tl_new:c { g__mark_previous-column_first_ #1 _tl }
35 \tl_new:c { g__mark_previous-column_last_ #1 _tl }

```

But for columns we also allocate token lists for the alias regions `first-column` and `last-column`.

```

36 \tl_new:c { g__mark_first-column_top_ #1 _tl }
37 \tl_new:c { g__mark_first-column_first_ #1 _tl }
38 \tl_new:c { g__mark_first-column_last_ #1 _tl }
39 \tl_new:c { g__mark_last-column_top_ #1 _tl }
40 \tl_new:c { g__mark_last-column_first_ #1 _tl }
41 \tl_new:c { g__mark_last-column_last_ #1 _tl }
42 }

```

(End definition for `\mark_new_class:n` and `\__mark_new_class:nn`. This function is documented on page 792.)

## 7.2 Updating mark structures

```

\l__mark_box
\g__mark_tmp_tl
\g__mark_new_top_tl

```

For some operations we need a temporary private box and two private global token lists.

```

43 \box_new:N \l__mark_box
44 \tl_new:N \g__mark_tmp_tl
45 \tl_new:N \g__mark_new_top_tl

```

(End definition for `\l__mark_box`, `\g__mark_tmp_tl`, and `\g__mark_new_top_tl`.)

```
\__mark_update_structure:nn
```

This function updates the mark structures. The first argument is the region to update and second argument receives the material that holds the marks. Out of this material we extract the first and last marks for all classes (if there are any) to do the assignments.

```

46 \cs_new_protected:Npn \__mark_update_structure:nn #1#2
47 {

```

First thing we do is copying the current structure to `previous-...`; this leaves the current structure untouched so we can update it class by class (which is necessary).

```

48 \__mark_update_structure_alias:nn { previous-#1 } {#1}

```

Getting the first and last marks out of the material in `#2` is done by putting the material in a box and then doing a split operation to the maximum size possible (which hopefully means all of the content).<sup>37</sup> Because this is an action only for the sake of getting at the mark values we don't want any underfull box warnings so we turn those (locally) off.

```

49 \group_begin:
50 \dim_set_eq:NN \tex_splitmaxdepth:D \c_max_dim
51 \int_set_eq:NN \tex_vbadness:D \c_max_int
52 \dim_set_eq:NN \tex_vfuzz:D \c_max_dim

```

---

<sup>37</sup>We could verify this, maybe we should.



There is a further complication: if the region contains infinite shrinking glue then a `\vsplit` operation will balk with a low-level error. Now pages or columns, which are our main concern here, can't have such infinite shrinkage if they are cut straight from the galley, however the use of `\enlargethispage` actually does add some at the very bottom (and also wraps the whole page into a box by itself, so if we leave it this way then a) we get this error and b) we don't see any marks because they are hidden one level down).

Another possible issue are packages or user code that place stray `\vboxes` directly into the main galley (an example is `marginnote` that attaches its marginals in this way). If such boxes end up as the last item on the page we should not unpack them.

We therefore do an `\unskip` to get rid of that glue if present and also check if we have then a `\vbox` as the last item and if so unpack that too, but only under certain conditions, see below. All this is temporary, just for getting the marks out, so it doesn't affect the final page production.

In fact, we go one step further and set the box to a large negative height possible and afterwards take a look at the reported badness: if it is zero we know that there has still been infinite shrinkage in the box so that we can't do a `\vsplit`. If that is the case we generate an error message and bypass extracting the marks. We use only half of `\c_max_dim` because otherwise TeX will report an overfull vbox despite our setting of `\tex_vfuzz:D`. This test will not find existing infinite shrinkage in all cases, e.g., if there are several glues that cancel each other, but it is the best we can do.

```

53      \vbox_set_to_ht:Nnn \l__mark_box { -.5\c_max_dim }
54      {
55          #2
56          \tex_unskip:D
57          \box_set_to_last:N \l__mark_box

```

After having removed the last box from the current list (if there was one) we check if the list is now empty. If not, the the last box is definitely not the one from `\enlargethispage` and so we can and should leave it alone. Otherwise we check if this last box is a `\vbox`.

```

58      \int_compare:nNnT \tex_lastnodetype:D < 0
59      {
60          \box_if_vertical:NT \l__mark_box
61          {

```

If it is we do a further test and reset the `\l__mark_box` to check if it contains infinitely shrinkable glue.

```

62          \vbox_set_to_ht:Nnn \l__mark_box { -.5\c_max_dim }
63          {
64              \vbox_unpack:N \l__mark_box
65              \tex_kern:D \c_zero_dim % ensure that box
66                                  % is not empty
67          }

```

If not, then we unpack it, if yes we still ignore it for the process of mark extraction. We do not generate an error though, because in all likelihood this is an ordinary box like a marginal that does contain something like `\vss`.

```

68          \int_compare:nNnT \tex_badness:D > 0
69          { \vbox_unpack:N \l__mark_box }
70      }
71  }

```

If it wasn't a vbox, it was either an hbox or there was no box. Given that we are only interested in the marks we don't need put it back in that case. However, we have to

make sure that the outer box under construction is not totally empty (which it might have been from the start, or now), because  $\TeX$  does not report a badness for empty boxes and that means our test would incorrectly conclude that we have infinite shrinking glue. A simple `\kern` is enough to avoid this (the same was already done above).

```

72         \tex_kern:D \c_zero_dim
73     }
74     \int_compare:nNnTF \tex_badness:D > 0

```

If the box had no infinite shrinkage (or rather if our test didn't show any) we vsplit it. Note that it doesn't matter that we set it to this strange size first. If there was infinite shrinkage after all, we end up with a low-level  $\TeX$  error, but if there is, it is a coding error and needs correcting.

```

75     {
76         \vbox_set_split_to_ht:NnN \l__mark_box \l__mark_box \c_max_dim

```

After this action we can get first and last marks of the various classes through `\tex_splitfirstmarks:D` and `\tex_splitbotmarks:D`. So now we loop over all classes stored in `\g__mark_classes_seq`.

```

77         \seq_map_inline:Nn \g__mark_classes_seq
78     {

```

First action: get the last mark from the previous region, i.e., `previous-#1`. But because it is also still inside `#1`, at the moment we use that to construct the name because this is a tiny bit faster. Given that we need this value in various assignments we store it away which avoids unnecessary further csname generations.

```

79         \tl_gset_eq:Nc \g__mark_new_top_tl { g__mark_#1_last_##1_tl }

```

This will first of all become the new top mark for the current class.

```

80         \tl_gset_eq:cN { g__mark_#1_top_##1_tl } \g__mark_new_top_tl

```

Next action is to get ourselves the new last mark from the material supplied.

```

81         \tl_gset:No \g__mark_tmp_tl
82         { \tex_splitbotmarks:D \use:c { c__mark_class_##1_mark } }

```

If this mark doesn't exist then obviously first mark does neither, so both become the last mark from the previous region. We have to be a little careful here: something like `\mark_insert:nn{foo}{}` adds an "empty" mark that should not be confused with no mark at all. But no mark in our material will result in `\g__mark_tmp_tl` being fully empty. This is why we have to make sure that "empty" from `\mark_insert:nn` only appears to be empty but fails the next test (see below how this is done).

```

83         \tl_if_empty:NTF \g__mark_tmp_tl
84         {
85             \tl_gset_eq:cN { g__mark_#1_last_ ##1_tl }
86             \g__mark_new_top_tl
87             \tl_gset_eq:cN { g__mark_#1_first_##1_tl }
88             \g__mark_new_top_tl
89         }

```

If it wasn't empty, i.e., if it had a real value then we use this value for our new last mark instead.

```

90         {
91             \tl_gset_eq:cN { g__mark_#1_last_##1_tl } \g__mark_tmp_tl

```

Because we had a last mark we also have a first mark (which might be the same, but might be not), so we pick that up and assign it to the appropriate token list. This explains why we first checked for the last mark because that makes the processing faster in case there is none.

```

92             \tl_gset:co { g__mark_#1_first_##1_tl }
93             {
94                 \tex_splitfirstmarks:D
95                 \use:c { c__mark_class_##1_mark }
96             }
97         }
98     }
99 }

```

If the badness was zero (we actually tested for  $> 0$  but it can't get negative) then we had infinite shrinkage, so we report that and set all marks to the value the last mark had before.

```

100     {
101         \msg_error:nnn { mark } { infinite-shrinkage } {#1}
102         \seq_map_inline:Nn \g__mark_classes_seq
103         {
104             \tl_gset_eq:cc { g__mark_#1_top_   ##1_tl }
105                         { g__mark_#1_last_   ##1_tl }
106             \tl_gset_eq:cc { g__mark_#1_first_##1_tl }
107                         { g__mark_#1_last_   ##1_tl }
108         }
109     }

```

Once all mark classes have been processed the data structures are updated and we can close the group which undoes our local changes and retains only the global ones.

```

110     \group_end:
111 }

```

*(End definition for \\_\_mark\_update\_structure:nn.)*

`\__mark_update_structure_alias:nn`

This function copies the structure for one region to another (name), e.g., from `page` to `previous-page` above, or later from `column` to `first-column`, etc.

```

112 \cs_new_protected:Npn \__mark_update_structure_alias:nn #1#2 {

```

This requires a simple loop through all mark classes copying the token list from one name to the next.

```

113     \seq_map_inline:Nn \g__mark_classes_seq
114     {
115         \tl_gset_eq:cc { g__mark_ #1 _top_   ##1 _tl }
116                     { g__mark_ #2 _top_   ##1 _tl }
117         \tl_gset_eq:cc { g__mark_ #1 _first_ ##1 _tl }
118                     { g__mark_ #2 _first_ ##1 _tl }
119         \tl_gset_eq:cc { g__mark_ #1 _last_  ##1 _tl }
120                     { g__mark_ #2 _last_  ##1 _tl }
121     }
122 }

```

*(End definition for \\_\_mark\_update\_structure\_alias:nn.)*

```

\__mark_update_structure_to_err:n
\__mark_error:n
123 \cs_new_protected:Npn \__mark_update_structure_to_err:n #1 {
124   \seq_map_inline:Nn \g__mark_classes_seq
125   {
126     \tl_gset:cn { g__mark_ #1 _top_   ##1 _tl } { \__mark_error:n {#1} }
127     \tl_gset:cn { g__mark_ #1 _first_ ##1 _tl } { \__mark_error:n {#1} }
128     \tl_gset:cn { g__mark_ #1 _last_  ##1 _tl } { \__mark_error:n {#1} }
129   }
130 }

```

A slight variation is to install a fixed error message as the value. Given that this is used in only one place, we could hardwire the argument which would be a bit more compact, but who knows, perhaps we end up with another reason to use this error command elsewhere, so for now we keep the argument.

```

131 \cs_new_protected:Npn \__mark_error:n #1 {
132   \msg_error:nnn { mark } { invalid-use } {#1}
133 }

```

(End definition for `\__mark_update_structure_to_err:n` and `\__mark_error:n`.)

### 7.3 Placing and retrieving marks

`\mark_insert:nn` This function puts a mark for some *⟨class⟩* at the current point.

```

134 \cs_new_protected:Npn \mark_insert:nn #1#2
135 {
136   \seq_if_in:NnTF \g__mark_classes_seq {#1}
137   {

```

We need to pass the evaluated argument into the mark but protected commands should not expand including those protected using the `\protect` approach of L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>. We also disable `\label` and the like.<sup>38</sup>

At this point the code eventually should get a public (and a kernel) hook instead of a set of hardwired settings.

```

138   \group_begin:

```

Within the group we alter some comments, e.g. `\label` or `\index`, to do the right at this point. This is done in the kernel hook `\@kernel@before@insertmark` which is followed by the public hook `insertmark` that can be used by packages to augment or alter that setup as necessary.

```

139   \@kernel@before@insertmark
140   \hook_use:n { insertmark }
141   \unrestored@protected@xdef \g__mark_tmp_tl {#2}
142   <{*trace}
143   \__mark_debug:n{ \iow_term:x { Marks:~ set-#1~<--
144     '\tl_to_str:V \g__mark_tmp_tl' ~ \msg_line_context: } }
145   <{/trace}
146   \tex_marks:D \use:c { c__mark_class_ #1 _mark }
147   {

```

Here is the trick to avoid truly empty marks: if the result from the above processing is empty we add something which eventually becomes empty, but not immediately; otherwise we just put `\g__mark_tmp_tl` in.

```

148   \tl_if_empty:NTF \g__mark_tmp_tl

```

<sup>38</sup>Straight copy from `latex.ltx` but is this even correct? At least a label in a running header makes little sense if it get set several times! Maybe that needs looking at in the 2e kernel.

```

149             { \exp_not:n { \prg_do_nothing: } }
150             { \exp_not:o { \g__mark_tmp_tl } }
151         }
152     \group_end:

```

A mark introduces a possible break point and in certain situations that should not happen in vertical mode in L<sup>A</sup>T<sub>E</sub>X. This needs some cleanup ....

```

153     \if@nobreak\ifvmode\nobreak\fi\fi
154 }

```

If the mark class was not known, raise an error.

```

155 {
156     \msg_error:nnx { mark } { unknown-class }
157     { \tl_to_str:n {#1} }
158 }
159 }

```

(End definition for `\mark_insert:nn`. This function is documented on page 792.)

`\@kernel@before@insertmark` By default `\label`, `\index`, and `\glossary` do nothing when the mark is inserted.

```

insertmark
160 \cs_new:Npn \@kernel@before@insertmark {
161     \cs_set_eq:NN \label \scan_stop:
162     \cs_set_eq:NN \index \scan_stop:
163     \cs_set_eq:NN \glossary \scan_stop:
164 }

```

The public hook to augment the setup.

```

165 \hook_new:n {insertmark}

```

(End definition for `\@kernel@before@insertmark` and `insertmark`.)

`\mark_use_top:nn` To retrieve the first, last or top region mark, we grab the appropriate value stored in the  
`\mark_use_first:nn` corresponding token list variable and pass its contents back. These functions should be  
`\mark_use_last:nn` used only in output routines after `\__mark_update_structure:nn` has acted, otherwise  
their value will be wrong.

If used with an unknown class or region they generate an error (fairly low-level because we are in an expandable context).

```

166 \cs_new:Npn \mark_use_first:nn #1#2 { \exp_not:v { g__mark_#1_first_#2_tl } }
167 \cs_new:Npn \mark_use_last:nn #1#2 { \exp_not:v { g__mark_#1_last_#2_tl } }
168 \cs_new:Npn \mark_use_top:nn #1#2 { \exp_not:v { g__mark_#1_top_#2_tl } }

```

(End definition for `\mark_use_top:nn`, `\mark_use_first:nn`, and `\mark_use_last:nn`. These functions are documented on page 793.)

## 7.4 Comparing mark values

`\mark_if_eq:nnnnTF` Test if in a given region (#1) for a given class (#2) the marks in position #3 and #4 (top,  
`\mark_if_eq:nnnnnnTF` first, or last) are identical

```

169 \prg_new_conditional:Npnn \mark_if_eq:nnnn #1#2#3#4 { T , F , TF }
170 {
171     \tl_if_eq:ccTF { g__mark_ #1 _#3_ #2 _tl }
172                     { g__mark_ #1 _#4_ #2 _tl }
173                     \prg_return_true:
174                     \prg_return_false:
175 }

```

The fully general test (with two triplets of the form  $\langle region \rangle$ ,  $\langle class \rangle$ , and  $\langle position \rangle$ ) is this:

```

176 \prg_new_conditional:Npnn \mark_if_eq:nnnnnn #1#2#3#4#5#6 { T , F , TF }
177 {
178   \tl_if_eq:ccTF { g__mark_ #1 _#3_ #2 _tl }
179                 { g__mark_ #4 _#6_ #5 _tl }
180                 \prg_return_true:
181                 \prg_return_false:
182 }

```

(End definition for `\mark_if_eq:nnnnTF` and `\mark_if_eq:nnnnnnTF`. These functions are documented on page 794.)

## 7.5 Messages

Mark errors are LaTeX kernel errors:

```

183 \prop_gput:Nnn \g_msg_module_type_prop { mark } { LaTeX }
184 \msg_new:nnnn { mark } { class-already-defined }
185 { Mark~class~'#1'~already~defined }
186 {
187   \c__msg_coding_error_text_tl
188   LaTeX~was~asked~to~define~a~new~mark~class~called~'#1':~
189   this~mark~class~already~exists.
190   \c__msg_return_text_tl
191 }
192 \msg_new:nnnn { mark } { unknown-class }
193 { Unknown~mark~class~'#1'. }
194 {
195   \c__msg_coding_error_text_tl
196   LaTeX~was~asked~to~manipulate~a~mark~of~class~'#1',~
197   but~this~class~of~marks~does~not~exist.
198 }
199
200 \msg_new:nnnn { mark } { invalid-use }
201 { Mark~region~'#1'~not~usable }
202 {
203   \c__msg_coding_error_text_tl
204   The~region~'#1'~can~only~be~used~after~
205   all~columns~have~been~assembled.
206   \c__msg_return_text_tl
207 }
208 \msg_new:nnnn { mark } { infinite-shrinkage }
209 { Infinite~shrinkage~found~in~'#1'. }
210 {
211   \c__msg_coding_error_text_tl
212   The~mark~region~'#1'~contains~some~infinite~negative~glue~
213   allowing~it~to~shrink~to~an~arbitrary~size.~
214   This~makes~it~impossible~to~split~the~region~apart~to~
215   get~at~its~marks.~They~are~lost.
216 }

```

## 7.6 Debugging the mark structures

Code and commands in this section are not final, it needs more experimentation to see what kind of tracing information is going to be useful in practice. For now the tracing is mainly meant to be used for code testing and not so much for application testing.

It is quite likely that the commands and the behavior of the tracing might change in the future once we gained some experience with it.

```
\g__mark_debug_bool Holds the current debugging state.
217 \bool_new:N \g__mark_debug_bool
(End definition for \g__mark_debug_bool.)

\mark_debug_on: Turns debugging on and off by redefining \__mark_debug:n.
\mark_debug_off:
\__mark_debug:n 218 \cs_new_eq:NN \__mark_debug:n \use_none:n
\__mark_debug_gset: 219 \cs_new_protected:Npn \mark_debug_on:
220 {
221   \bool_gset_true:N \g__mark_debug_bool
222   \__mark_debug_gset:
223 }
224 \cs_new_protected:Npn \mark_debug_off:
225 {
226   \bool_gset_false:N \g__mark_debug_bool
227   \__mark_debug_gset:
228 }
229 \cs_new_protected:Npn \__mark_debug_gset:
230 {
231   \cs_gset_protected:Npx \__mark_debug:n ##1
232   { \bool_if:NT \g__mark_debug_bool {##1} }
233 }

(End definition for \mark_debug_on: and others. These functions are documented on page 795.)

\DebugMarksOn CamelCase commands for debugging.
\DebugMarksOff
234 \cs_new_eq:NN \DebugMarksOn \mark_debug_on:
235 \cs_new_eq:NN \DebugMarksOff \mark_debug_off:

(End definition for \DebugMarksOn and \DebugMarksOff. These functions are documented on page 795.)

\__mark_class_status:nn Shows the mark values across all regions for one mark class (#2). The first argument
gives some <info> to help identifying where the command was called.
236 <*trace>
237 \cs_new_protected:Npn \__mark_class_status:nn #1#2
238 {
239   \typeout{ Marks:~#2~ #1:}
240   \typeout{\@spaces page~ (current):
241     | \exp_not:v { g__mark_page_top_ #2 _t1 }
242     | \exp_not:v { g__mark_page_first_ #2 _t1 }
243     | \exp_not:v { g__mark_page_last_ #2 _t1 } |}
244   \typeout{\@spaces page~ (previous):
245     | \exp_not:v { g__mark_previous-page_top_ #2 _t1 }
246     | \exp_not:v { g__mark_previous-page_first_ #2 _t1 }
247     | \exp_not:v { g__mark_previous-page_last_ #2 _t1 } |}
248   \typeout{\@spaces column~ (previous):
```

```

249         | \exp_not:v { g__mark_previous-column_top_ #2 _t1 }
250         | \exp_not:v { g__mark_previous-column_first_ #2 _t1 }
251         | \exp_not:v { g__mark_previous-column_last_ #2 _t1 }      |}
252     \typeout{\@spaces column~ (current):
253         | \exp_not:v { g__mark_column_top_ #2 _t1 }
254         | \exp_not:v { g__mark_column_first_ #2 _t1 }
255         | \exp_not:v { g__mark_column_last_ #2 _t1 }      |}
256     \typeout{\@spaces column~ (first):
257         | \exp_not:v { g__mark_first-column_top_ #2 _t1 }
258         | \exp_not:v { g__mark_first-column_first_ #2 _t1 }
259         | \exp_not:v { g__mark_first-column_last_ #2 _t1 }      |}
260     \typeout{\@spaces column~ (second):
261         | \exp_not:v { g__mark_last-column_top_ #2 _t1 }
262         | \exp_not:v { g__mark_last-column_first_ #2 _t1 }
263         | \exp_not:v { g__mark_last-column_last_ #2 _t1 }      |}
264 }

```

(End definition for `\__mark_class_status:nn`.)

`\__mark_status:n` Show all mark class values across all regions.

```

265 \cs_new_protected:Npn \__mark_status:n #1
266 {
267     \seq_map_inline:Nn \g__mark_classes_seq
268     { \__mark_class_status:nn {#1} {##1} }
269 }
270 </trace>

```

(End definition for `\__mark_status:n`.)

## 7.7 Designer-level interfaces

**`\NewMarkClass`** These two are identical to the L3 programming layer commands.

**`\InsertMark`**

```

271 \cs_new_eq:NN \NewMarkClass \mark_new_class:n
272 \@onlypreamble \NewMarkClass
273 \cs_new_eq:NN \InsertMark \mark_insert:nn

```

(End definition for `\NewMarkClass` and `\InsertMark`. These functions are documented on page 792.)

**`\TopMark`** The following commands take an optional argument that defaults to page. There is no  
**`\FirstMark`** checking that the region is actually valid. If not there is simply an empty return.  
**`\LastMark`**

```

274 \NewExpandableDocumentCommand \FirstMark { 0{page} m }
275 { \mark_use_first:nn {#1}{#2} }
276 \NewExpandableDocumentCommand \LastMark { 0{page} m }
277 { \mark_use_last:nn {#1}{#2} }
278 \NewExpandableDocumentCommand \TopMark { 0{page} m }
279 { \mark_use_top:nn {#1}{#2} }

```

(End definition for `\TopMark`, `\FirstMark`, and `\LastMark`. These functions are documented on page 793.)



**\IfMarksEqualTF** We only provide a CamelCase command for the case with one region (optional) and one class. One could think of also providing a version for the general case with several optional arguments, but use cases for this are most likely rare, so not done yet.

```

280 \NewExpandableDocumentCommand \IfMarksEqualTF {0{page}mmm} {
281   \mark_if_eq:nnnnTF {#1}{#2}{#3}{#4}
282 }

```

(End definition for \IfMarksEqualTF. This function is documented on page 794.)

## 8 L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> integration

### 8.1 Core L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> integration

**\\_mark\\_update\\_singlecol\\_structures:** This command updates the mark structures if we are producing a single column document.

```

283 \cs_new_protected:Npn \_mark\_update\_singlecol\_structures: {

```

First we update the page region (which also updates the previous-page).

The \@outputbox is normally in \vbox in L<sup>A</sup>T<sub>E</sub>X but we can't take that for granted (an amsmath test document changed it to an \hbox just to trip me up) so we are a little careful with unpack now.

```

284   \box_if_vertical:NTF \@outputbox
285   {
286     \_mark\_update\_structure:nn {page}
287     { \vbox_unpack:N \@outputbox }
288   }
289   {
290     \_mark\_update\_structure:nn {page}
291     { \hbox_unpack:N \@outputbox }
292   }

```

The we provide the necessary updates for the aliases.

```

293   \_mark\_update\_structure\_alias:nn {previous-column}{previous-page}
294   \_mark\_update\_structure\_alias:nn {column}{page}
295   \_mark\_update\_structure\_alias:nn {first-column}{page}
296   \_mark\_update\_structure\_alias:nn {last-column}{page}
297   < *trace >
298   % move this into status itself?
299   \_mark\_debug:n
300   {
301     \_mark\_status:n
302     { in~ OR~ (
303       \legacy_if:nTF {@twoside}
304       { twoside-
305         \int_if_odd:nTF \c@page
306         { odd } { even }
307       }
308       { onside }
309     )
310   }
311 }
312 < /trace >
313 }

```

(End definition for `\_mark\_update\_singlecol\_structures:`.)

`\_mark\_update\_dblcol\_structures:` This commands handles the updates if we are doing two-column pages.

```
314 \cs_new_protected:Npn \_mark\_update\_dblcol\_structures: {
```

First we update the `column` and `previous-column` regions using the material assembled in `\@outputbox`.

```
315   \box_if_vertical:NTF \@outputbox
316   {
317     \_mark\_update\_structure:nn {column}
318     { \vbox_unpack:N \@outputbox }
319   }
320   {
321     \_mark\_update\_structure:nn {column}
322     { \hbox_unpack:N \@outputbox }
323   }
```

How we have to update the alias regions depends on whether or not `\@opcol` was called to process the first column or to produce the completed page

```
324   \legacy_if:NTF {@firstcolumn}
325   {
```

If we are processing the first column then `column` is our `first-column` and there is no `last-column` yet, so we make those an error.

```
326     \_mark\_update\_structure\_alias:nn {first-column}{column}
327     \_mark\_update\_structure\_to\_err:n {last-column}
328   }
329   {
```

If we produce the completed page then the `first-column` is the same as the new `previous-column`. However, the structure should already be correct if you think about it (because it was set to `column` last time which is now the `previous-column`), thus there is no need to make an update.

```
330 %     \_mark\_update\_structure\_alias:nn {first-column}{previous-column}
```

However, we now have a proper `last-column` so we assign that.

```
331     \_mark\_update\_structure\_alias:nn {last-column}{column}
```

What now remains doing is to update the `page` and `previous-page` regions. For this we have to copy the settings in `page` into `previous-page` and then update `page` such that the top and first marks are taken from the `first-column` region and the last marks are taken from the `last-column` region. All this has to be done for all mark classes so we loop over our sequence.

Note that one loop is needed if we arrange the copy statements in a suitable way.

```
332   \seq_map_inline:Nn \g__mark\_classes\_seq
333   {
334     \tl_gset_eq:cc { g__mark\_previous-page\_top_   ##1 _tl }
335                   { g__mark\_page\_top_             ##1 _tl }
336     \tl_gset_eq:cc { g__mark\_previous-page\_first_ ##1 _tl }
337                   { g__mark\_page\_first_           ##1 _tl }
338     \tl_gset_eq:cc { g__mark\_previous-page\_last_  ##1 _tl }
339                   { g__mark\_page\_last_            ##1 _tl }
```

The `page` updates need to come after the corresponding updates for `previous-page` otherwise we loose the necessary value.

```

340         \tl_gset_eq:cc { g__mark_page_top_      ##1 _tl }
341                     { g__mark_first-column_top_  ##1 _tl }
342         \tl_gset_eq:cc { g__mark_page_first_     ##1 _tl }
343                     { g__mark_first-column_first_ ##1 _tl }
344         \tl_gset_eq:cc { g__mark_page_last_      ##1 _tl }
345                     { g__mark_last-column_last_  ##1 _tl }
346     }
347 }
348 < *trace >
349     \__mark_debug:n
350     {
351         \__mark_status:n
352         { in~ OR~ (
353             \legacy_if:nTF {@twoside}
354             { twoside-
355                 \int_if_odd:nTF \c@page
356                 { odd }{ even }
357             }
358             { onside }
359             \space
360             \legacy_if:nTF {@firstcolumn}
361             { first~ }{ second~ }
362             column )
363         }
364     }
365 < /trace >
366 }

```

(End definition for `\__mark_update_dblcol_structures:.`)

```

367 < @@= >

```

```

\expl@@@mark@update@singlecol@structures@@
\expl@@@mark@update@dblcol@structures@@

```

```

368 \cs_new_eq:NN \expl@@@mark@update@singlecol@structures@@
369             \__mark_update_singlecol_structures:
370 \cs_new_eq:NN \expl@@@mark@update@dblcol@structures@@
371             \__mark_update_dblcol_structures:

```

(End definition for `\expl@@@mark@update@singlecol@structures@@` and `\expl@@@mark@update@dblcol@structures@@`.)

## 8.2 Other L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> output routines

This section will cover `multicol` and other packages altering or providing their own output routine. Not done yet.

```

372 < latexrelease > \IncludeInRelease{0000/00/00}{ltmarks}%
373 < latexrelease >             {Undo~Marks~handling}
374 < latexrelease >

```

We keep the interface commands around even if we roll back in case they are used in packages that don't roll back. Not likely to do a lot of good, but then there is not much we can do, but this at least then doesn't give errors.

```

375 <latexrelease>\DeclareRobustCommand \NewMarkClass[1]{ }
376 <latexrelease>\DeclareRobustCommand \InsertMark[2]{ }
377 <latexrelease>\RenewExpandableDocumentCommand \FirstMark { 0{ } m } { }
378 <latexrelease>\RenewExpandableDocumentCommand \LastMark { 0{ } m } { }
379 <latexrelease>\RenewExpandableDocumentCommand \TopMark { 0{ } m } { }
380 <latexrelease>\RenewExpandableDocumentCommand \IfMarksEqualTF { 0{ } mmm }{ }
381 <latexrelease>

```

Same here, this avoided extra roll back code in the OR.

```

382 <latexrelease>\let \@@expl@@@mark@update@singlecol@structures@@ \relax
383 <latexrelease>\let \@@expl@@@mark@update@dblcol@structures@@ \relax
384 <latexrelease>
385 <latexrelease>
386 <latexrelease>\EndModuleRelease

387 \ExplSyntaxOff
388 </2ekernel | latexrelease>

    Reset module prefix:
389 <@@= >

```

## File T

# ltpage.dtx

## 1 Page styles and related commands

### 1.1 Page Style Commands

`\pagestyle{<style>}` : sets the page style of the current and succeeding pages to *style*

`\thispagestyle{<style>}` : sets the page style of the current page only to *style*.

To define a page style *style*, you must define `\ps@style` to set the page style parameters.

### 1.2 How a page style makes running heads and feet

The `\ps@...` command defines the macros `\@oddhead`, `\@oddfoot`, `\@evenhead`, and `\@evenfoot` to define the running heads and feet. (See output routine.) To make headings determined by the sectioning commands, the page style defines the commands `\chaptermark`, `\sectionmark`, etc., where `\chaptermark{<text>}` is called by `\chapter` to set a mark. The `\...mark` commands and the `\...head` macros are defined with the help of the following macros.

(All the `\...mark` commands should be initialized to no-ops.)

### 1.3 marking conventions

L<sup>A</sup>T<sub>E</sub>X extends T<sub>E</sub>X's `\mark` facility by producing two kinds of marks a 'left' and a 'right' mark, using the following commands:

`\markboth{<left>}{<right>}` : Adds both marks.

`\markright{<right>}` : Adds a 'right' mark.

`\leftmark` : Used in the output routine, gets the current 'left' mark. Works like T<sub>E</sub>X's `\botmark`.

`\rightmark` : Used in the output routine, gets the current 'right' mark. Works like T<sub>E</sub>X's `\firstmark`. The marking commands work reasonably well for right marks 'numbered within' left marks—e.g., the left mark is changed by a `\chapter` command and the right mark is changed by a `\section` command. However, it does produce somewhat anomalous results if 2 `\markboth`'s occur on the same page.

Commands like `\tableofcontents` that should set the marks in some page styles use a `\@mkboth` command, which is `\let` by the `\pagestyle` command (`\ps@...`) to `\markboth` for setting the heading or to `\@gobbletwo` to do nothing.

1 <\*2ekernel>

`\pagestyle` User command to set the page style for this and following pages.

```
2 \def\pagestyle#1{%
3   \@ifundefined{ps@#1}%
4     \undefinedpagestyle
5     {\@nameuse{ps@#1}}}
```

(End definition for `\pagestyle`.)

`\thispagestyle` User command to set the page style for this page only.

```
6 \def\thispagestyle#1{%
7   \ifundefined{ps@#1}%
8     \undefinedpagestyle
9     {\global\@specialpagetrue\gdef\@specialstyle{#1}}}
```

(End definition for `\thispagestyle`.)

`\ps@empty` The empty page style: No head or foot line.

```
10 \def\ps@empty{%
11   \let\@mkboth\@gobbletwo\let\@oddhead\@empty\let\@oddfoot\@empty
12   \let\@evenhead\@empty\let\@evenfoot\@empty}
```

(End definition for `\ps@empty`.)

`\ps@plain` The plain page style: No head, centred page number in foot.

```
13 \def\ps@plain{\let\@mkboth\@gobbletwo
14   \let\@oddhead\@empty\def\@oddfoot{\reset@font\hfil\thepage
15   \hfil}\let\@evenhead\@empty\let\@evenfoot\@oddfoot}
```

(End definition for `\ps@plain`.)

`\@leftmark` We implement `\@leftmark` and `\@rightmark` in terms of already defined commands to  
`\@rightmark` save token space. We can't get rid of them since they are sometimes used in applications.

```
16 \let\@leftmark\@firstoftwo
17 \let\@rightmark\@secondoftwo
```

(End definition for `\@leftmark` and `\@rightmark`.)

```
18 </2ekernel>
19 <*2ekernel | latexrelease>
20 <latexrelease>\IncludeInRelease{2022/06/01}%
21 <latexrelease>          {\markboth}{New mark support}%
```

`\markboth` User commands for setting L<sup>A</sup>T<sub>E</sub>X marks.

`\markright` Test for `\@nobreak` added 15 Apr 86 in `\markboth` and `\markright` letting `\label`  
and `\index` to `\relax` added 22 Feb 86 so these commands can appear in sectioning  
command arguments RmS 91/06/21 Same for `\glossary`

```
22 \ExplSyntaxOn
23 \DeclareRobustCommand*\markboth[2]{%
24   \begingroup
25     \let\label\relax \let\index\relax \let\glossary\relax
26     \unrestored@protected@xdef\@themark {{#1}{#2}}%
27     \@temptokena \expandafter{\@themark}%
```

In addition to generating the legacy mark we output the individual ones as well at the very same point. The legacy mark is kept unchanged in order to work with packages that expect that mark in exactly the way it is right now.

We might want to think about how to improve this in one-side documents, see comments below.

We have not changed all of the code to L<sup>3</sup> prog layer convention, in case packages attempt to do some patching and expect the 2e names being around. Eventually this should and will change.

```
28   \mark_insert:nn{2e-left}{#1}
29   \mark_insert:nn{2e-right}{#2}
```

```

30 \tl_if_empty:nF{#2}{ \mark_insert:nn{2e-right-nonempty}{#2} }
31 \mark{\the\@temptokena}%
32 \endgroup
33 \if@nobreak\ifvmode\nobreak\fi\fi}

34 \DeclareRobustCommand*\markright[1]{%
35 \begingroup
36 \let\label\relax \let\index\relax \let\glossary\relax

```

Protection is handled inside \@markright.

```

37 \expandafter\@markright\@themark {#1}%
38 \@temptokena \expandafter{\@themark}%

```

Same game with \markright more or less ...

```

39 \mark_insert:nn{2e-right}{#1}
40 \tl_if_empty:nF{#1}{ \mark_insert:nn{2e-right-nonempty}{#1} }

```

The legacy L<sup>A</sup>T<sub>E</sub>X mechanism always sets left and right mark, i.e., if a sub-mark (i.e., right mark) is set the corresponding main mark also is getting a mark with the same value it had previously. However, for the individual mark classes this means we are losing information so for them that is not done.

```

41 % \mark_insert:nn{2e-left}{\exp_after:wN \use_i:nn \@themark }
42 \mark{\the\@temptokena}%
43 \endgroup
44 \if@nobreak\ifvmode\nobreak\fi\fi}
45 \ExplSyntaxOff

```

(End definition for \markboth and \markright. These functions are documented on page 795.)

```

46 </2ekernel | latexrelease>
47 <latexrelease>\EndIncludeInRelease
48 <latexrelease>\IncludeInRelease{2019/10/01}%
49 <latexrelease> \markboth{Make commands robust}%
50 <latexrelease>
51 <latexrelease>\DeclareRobustCommand*\markboth[2]{%
52 <latexrelease> \begingroup
53 <latexrelease> \let\label\relax \let\index\relax \let\glossary\relax
54 <latexrelease> \unrestored@protected@xdef\@themark {{#1}{#2}}%
55 <latexrelease> \@temptokena \expandafter{\@themark}%
56 <latexrelease> \mark{\the\@temptokena}%
57 <latexrelease> \endgroup
58 <latexrelease> \if@nobreak\ifvmode\nobreak\fi\fi}
59 <latexrelease>\DeclareRobustCommand*\markright[1]{%
60 <latexrelease> \begingroup
61 <latexrelease> \let\label\relax \let\index\relax \let\glossary\relax
62 <latexrelease> \expandafter\@markright\@themark {#1}%
63 <latexrelease> \@temptokena \expandafter{\@themark}%
64 <latexrelease> \mark{\the\@temptokena}%
65 <latexrelease> \endgroup
66 <latexrelease> \if@nobreak\ifvmode\nobreak\fi\fi}
67 <latexrelease>
68 <latexrelease>\EndIncludeInRelease
69 <latexrelease>\IncludeInRelease{0000/00/00}%
70 <latexrelease> \markboth{Make commands robust}%
71 <latexrelease>
72 <latexrelease>\kernel@make@fragile\markboth

```

```

73 <latexrelease>\kernel@make@fragile\markright
74 <latexrelease>
75 <latexrelease>\EndIncludeInRelease
76 <*2ekernel>

\@markright
  \leftmark 77 \def\@markright#1#2#3{\@temptokena {#1}%
  \rightmark 78   \unrestored@protected@xdef\@themark{\the\@temptokena}{#3}}
79 \def\leftmark{\expandafter\@leftmark\botmark\@empty\@empty}
80 \def\rightmark{\expandafter\@rightmark\firstmark\@empty\@empty}

(End definition for \@markright, \leftmark, and \rightmark.)

\@themark Initialise LATEX's marks without setting a TEX mark <whatsit>.
81 \def\@themark{\{}{\}}

(End definition for \@themark.)

\mark Test versions of LATEX 2ε initialised TEX's \mark system at this point, but this was
removed before the first release.

AtBeginDocument{\mark{\{}{\}}{\}}

(End definition for \mark.)

\raggedbottom \raggedbottom typesets pages with no vertical stretch, so they have their natural height
instead of all being exactly the same height. (Uses a space of .0001fil to avoid interfering
with the 1fil space of \newpage.)

82 \DeclareRobustCommand\raggedbottom{%
83   \def\@textbottom{\vskip \z@ \@plus.0001fil}\let\@texttop\relax}

(End definition for \raggedbottom.)

\flushbottom \flushbottom: Inverse of \raggedbottom — makes all pages the same height.

84 \DeclareRobustCommand\flushbottom{%
85   \let\@textbottom\relax \let\@texttop\relax}

(End definition for \flushbottom.)

\sloppy \sloppy will never (well, hardly ever) produce overfull boxes, but may produce underfull
ones. (14 June 85)

86 \DeclareRobustCommand\sloppy{%
87   \tolerance 9999%
88   \emergencystretch 3em%
89   \hfuzz .5\p@
90   \vfuzz\hfuzz}

(End definition for \sloppy.)

sloppypar (env.) A sloppypar environment is equivalent to {\par \sloppy ... \par}.

91 \def\sloppypar{\par\sloppy}
92 \def\endsloppypar{\par}

```



**\fussy** Resets TeX's parameters to their normal finicky values.

```
93 \DeclareRobustCommand\fussy{%  
94   \emergencystretch\z@  
95   \tolerance 200%  
96   \hfuzz .1\p@  
97   \vfuzz\hfuzz}
```

*(End definition for \fussy.)*

**\overfullrule** L<sup>A</sup>T<sub>E</sub>X default is no overfull box rule. Changed by document class option.

```
98 \overfullrule 0pt
```

*(End definition for \overfullrule.)*

```
99 </2ekernel>
```

# File U

## ltclass.dtx

### 1 Introduction

This file implements the following declarations, which replace `\documentstyle` in  $\text{\LaTeX 2}_{\epsilon}$  documents.

Note that old documents containing `\documentstyle` will be run using a compatibility option—thus keeping everyone happy, we hope!

The overall idea is that there are two types of ‘style files’: ‘class files’ which define elements and provide a default formatting for them; and ‘packages’ which provide extra functionality. One difference between  $\text{\LaTeX 2}_{\epsilon}$  and  $\text{\LaTeX 2.09}$  is that  $\text{\LaTeX 2}_{\epsilon}$  packages may have options. Note that options to classes/packages may be implemented such that they input files, but these file names are not necessarily directly related to the option name.

### 2 User interface

`\documentclass[<main-option-list>]{<class>}[<version>]`

There must be exactly one such declaration, and it must come first. The *<main-option-list>* is a list of options which can modify the formatting of elements which are defined in the *<class>* file as well as in all following `\usepackage` declarations (see below). The *<version>* is a version number, beginning with a date in the format `YYYY/MM/DD`. If an older version of the class is found, a warning is issued.

`\documentstyle[<main-option-list>]{<class>}[<version>]`

The `\documentstyle` declaration is kept in order to maintain upward compatibility with  $\text{\LaTeX 2.09}$  documents. It is similar to `\documentclass`, but it causes all options in *<main-option-list>* that the *<class>* does not use to be passed to `\RequirePackage` after the options have been processed. This maintains compatibility with the 2.09 behaviour. Also a flag is set to indicate that the document is to be processed in  $\text{\LaTeX 2.09}$  compatibility mode. As far as most packages are concerned, this only affects the warnings and errors  $\text{\LaTeX}$  generates. This flag does affect the definition of font commands, and `\sloppy`.

`\usepackage[<package-option-list>]{<package-list>}[<version>]`

There can be any number of these declarations. All packages in *<package-list>* are called with the same options.

Each *<package>* file defines new elements (or modifies those defined in the *<class>*), and thus extends the range of documents which can be processed. The *<package-option-list>* is a list of options which can modify the formatting of elements defined in the *<package>* file. The *<version>* is a version number, beginning with a date in the format `YYYY/MM/DD`. If an older version of the package is found, a warning is issued.

Each package is loaded only once. If the same package is requested more than once, nothing happens, unless the package has been requested with options that were not given the first time it was loaded, in which case an error is produced.

As well as processing the options given in the *<package-option-list>*, each package processes the *<main-option-list>*. This means that options that affect all of the packages can be given globally, rather than repeated for every package.

Note that class files have the extension `.cls`, packages have the extension `.sty`.

`filecontents` (*env.*) The environment `filecontents` is intended for passing the contents of packages, options, or other files along with a document in a single file. It has one argument, which is the name of the file to create. If that file already exists (maybe only in the current directory if the OS supports a notion of a ‘current directory’ or ‘default directory’) then nothing happens (except for an information message) and the body of the environment is bypassed. Otherwise, the body of the environment is written verbatim to the file name given as the first argument, together with some comments about how it was produced.

The environment can also be called with an optional argument which is used to alter some of its behavior: option `force` or `overwrite` will allow for overwriting existing files, option `nosearch` will only check the current directory when looking if the file exists. This can be useful if you want to generate a local (modified) copy of some file that is already in the search tree of  $\text{\TeX}$ . Finally, you can use `noheader` to prevent it from writing the standard blurb at the top of the file (this is actually the same as using the star form of the environment).

The environment is now allowed anywhere in the document, but to ensure that all packages or options necessary are available when the document is run, it is normally best to place it at the top of your file (before `\documentclass`). A possible use case for using it inside the document body is if you want to reuse some text several times in the document you could then write it and later use `\input` to retrieve it where needed.

The begin and end tags should each be on a line by itself.

## 2.1 Option processing

When the options are processed, they are divided into two types: *local* and *global*:

- For a class, the options in the `\documentclass` command are local.
- For a package, the options in the `\usepackage` command are local, and the options in the `\documentclass` command are global.

The options for `\documentclass` and `\usepackage` are processed in the following way:

1. The local and global options that have been declared (using `\DeclareOption` as described below) are processed first.

In the case of `\ProcessOptions`, they are processed in the order that they were declared in the class or package.

In the case of `\ProcessOptions*`, they are processed in the order that they appear in the option-lists. First the global options, and then the local ones.

2. Any remaining local options are dealt with using the default option (declared using the `\DeclareOption*` declaration described below). For document classes, this usually does nothing, but records the option on a list of unused options. For packages, this usually produces an error.

Finally, when `\begin{document}` is reached, if there are any global options which have not been used by either the class or any package, the system will produce a warning.

## 3 Class and Package interface

### 3.1 Class name and version

`\ProvidesClass` A class can identify itself with the `\ProvidesClass{<name>}[<version>]` command. The `<version>` should begin with a date in the format YYYY/MM/DD.

### 3.2 Package name and version

`\ProvidesPackage` A package can identify itself with the `\ProvidesPackage{<name>}[<version>]` command. The `<version>` should begin with a date in the format YYYY/MM/DD.

### 3.3 Requiring other packages

`\RequirePackage` Packages or classes can load other packages using `\RequirePackage[<options>]{<name>}[<version>]`. If the package has already been loaded, then nothing happens unless the requested options are not a subset of the options with which it was loaded, in which case an error is called.

`\LoadClass` Similar to `\RequirePackage`, but for classes, may not be used in package files.

`\PassOptionsToPackage` Packages can pass options to other packages using:

`\PassOptionsToPackage{<options>}{<package>}`.

`\PassOptionsToClass` This adds the `<options>` to the options list of any future `\RequirePackage` or `\usepackage` command. For example:

```
\PassOptionsToPackage{foo,bar}{fred}
```

is the same as:

```
\RequirePackage[foo,bar,baz]{fred}
```

`\LoadClassWithOptions` `\LoadClassWithOptions{<name>}[<version>]:`

This is similar to `\LoadClass`, but it always calls class `<name>` with exactly the same option list that is being used by the current class, rather than an option explicitly supplied or passed on by `\PassOptionsToClass`. `\RequirePackageWithOptions` is the analogous command for packages.

`\RequirePackageWithOptions`

This is mainly intended to allow one class to simply build on another, for example:

```
\LoadClassWithOptions{article}
```

This should be contrasted with the slightly different construction

```
\DeclareOption*{\PassOptionsToClass{\CurrentOption}{article}}
\ProcessOptions
\LoadClass{article}
```

As used here, the effects are more or less the same, but the version using `\LoadClassWithOptions` is slightly quicker (and less to type). If, however, the class declares options of its own then the two constructions are different; compare, for example:

```
\DeclareOption{landscape}{...}
\ProcessOptions
\LoadClassWithOptions{article}
```

with:

```
\DeclareOption{landscape}{...}
\DeclareOption*{\PassOptionsToClass{\CurrentOption}{article}}
\ProcessOptions
\LoadClass{article}
```

In the first case, the `article` class will be called with option `landscape` precisely when the current class is called with this option; but in the second example it will not as in that case `article` is only passed options by the default option handler, which is not used for `landscape` as that option is explicitly declared.

```
\IfPackageLoadedTF      To find out if a package has already been loaded, use
\IfClassLoadedTF        \IfPackageLoadedTF{<package>}{<true>}{<false>}
\@ifpackageloaded
\@ifclassloaded
```

or the old name `\@ifpackageloaded`.

```
\IfPackageAtLeastTF    To find out if a package has already been loaded with a version equal to or more
\IfClassAtLeastTF      recent than <date>, use
\@ifpackagelater
\@ifclasslater          \IfPackageAtLeastTF{<package>}{<date>}{<true>}{<false>}
```

or the old name `\@ifpackagelater`.

```
\IfFormatAtLeastTF     To test the format date use
                        \IfFormatAtLeastTF{<date>}{<true>}{<false>}
```

```
\IfPackageLoadedWithOptionsTF  To find out if a package has already been loaded with at least the options <options>,
\IfClassLoadedWithOptionsTF use
\@ifpackagewith
\@ifclasswith            \IfPackageLoadedWithOptionsTF{<package>}{<options>}{<true>}{<false>}
```

or the old name `\@ifpackagewith`.

There exists one package that can't be tested with the above commands: the `fontenc` package pretends that it was never loaded to allow for repeated reloading with different options (see `ltoutenc.dtx` for details).

### 3.4 Declaring new options

Options for classes and packages are built using the same macros.

```
\DeclareOption          To define a builtin option, use \DeclareOption{<name>}{<code>}.
\DeclareOption*          To define the default action to perform for local options which have not been declared,
                        use \DeclareOption*{<code>}.
```

*Note:* there should be no use of

```
\RequirePackage, \DeclareOption, \DeclareOption* or \ProcessOptions
inside \DeclareOption or \DeclareOption*.
```

Possible uses for `\DeclareOption*` include:

```
\DeclareOption*{}
```

Do nothing. Silently accept unknown options. (This suppresses the usual warnings.)

```
\DeclareOption*{\@unknownoptionerror}
```

Complain about unknown local options. (The initial setting for package files.)

```
\DeclareOption*{\PassOptionsToPackage{\CurrentOption}{<pkg-name>}}
```

Handle the current option by passing it on to the package `<pkg-name>`, which will presumably be loaded via `\RequirePackage` later in the file. This is useful for building

‘extension’ packages, that perhaps handle a couple of new options, but then pass everything else on to an existing package.

```
\DeclareOption*{\InputIfFileExists{xx-\CurrentOption.yyy}%
  {}%
  {\OptionNotUsed}}
```

Handle the option `foo` by loading the file `xx-foo.yyy` if it exists, otherwise do nothing, but declare that the option was not used. Actually the `\OptionNotUsed` declaration is only needed if this is being used in class files, but does no harm in package files.

### 3.5 Safe Input Macros

<code>\InputIfFileExists</code>	<code>\InputIfFileExists{&lt;file&gt;}{&lt;then&gt;}{&lt;else&gt;}</code> Inputs <i>&lt;file&gt;</i> if it exists. Immediately before the input, <i>&lt;then&gt;</i> is executed. Otherwise <i>&lt;else&gt;</i> is executed.
<code>\IfFileExists</code>	As above, but does not input the file. One thing you might like to put in the <i>&lt;else&gt;</i> clause is
<code>\@missingfileerror</code>	This starts an interactive request for a filename, supplying default extensions. Just hitting return causes the whole input to be skipped and entering <code>x</code> quits the current run,
<code>\input</code>	This has been redefined from the L <sup>A</sup> T <sub>E</sub> X 2.09 definition, in terms of the new commands <code>\InputIfFileExists</code> and <code>\@missingfileerror</code> .
<code>\listfiles</code>	Giving this declaration in the preamble causes a list of all files input via the ‘safe input’ commands to be listed at the end. Any strings specified in the optional argument to <code>\ProvidesPackage</code> are listed alongside the file name. So files in standard (and other non-standard) distributions can put informative strings in this argument.

## 4 Implementation

<code>\if@compatibility</code>	<pre>1 &lt;*2ekernel&gt; The flag for compatibility mode. 2 \newif\if@compatibility (End definition for \if@compatibility.)</pre>
<code>\@documentclasshook</code>	<p>This legacy hook is called after the first <code>\documentclass</code> command. It is <i>not</i> integrated with the new 2020 hook management system! By default this checks to see if <code>\@normalsize</code> is undefined, and if so, sets it to <code>\normalsize</code>.</p> <pre>3 \def\@documentclasshook{% 4   \ifx\@normalsize\@undefined 5     \let\@normalsize\normalsize 6   \fi 7 }</pre> <p>(End definition for \@documentclasshook.)</p>
<code>\@declaredoptions</code>	<p>This list is automatically built by <code>\DeclareOption</code>. It is the list of options (separated by commas) declared in the class or package file and it defines the order in which the corresponding <code>\ds@&lt;option&gt;</code> commands are executed. All local <i>&lt;option&gt;</i>s which are not declared will be processed in the order defined by the optional argument of <code>\documentclass</code> or <code>\usepackage</code>.</p> <pre>8 \let\@declaredoptions\@empty</pre>

```

        (End definition for \@declaredoptions.)

\@classoptionslist List of options of the main class.
    9 \let\@classoptionslist\relax
    10 %\@onlypreamble\@classoptionslist
    (End definition for \@classoptionslist.)

\@raw@classoptionslist List of options of the main class (unprocessed).
    11 \let\@raw@classoptionslist\relax
    (End definition for \@raw@classoptionslist.)

\@unusedoptionlist List of options of the main class that haven't been declared or loaded as class option files.

    12 \let\@unusedoptionlist\@empty
    13 %\@onlypreamble\@unusedoptionlist
    (End definition for \@unusedoptionlist.)

\CurrentOption Name of current package or option.
    14 \let\CurrentOption\@empty
    (End definition for \CurrentOption.)

\@currpath Path to the current file if explicitly given.
    15 </2kernel>
    16 <*2kernel | latexrelease>
    17 <latexrelease>
    18 <latexrelease>\IncludeInRelease{2020/10/01}{\@currpath}%
    19 <latexrelease> {Add \@currpath}%
    20 \let\@currpath\@empty
    21 <latexrelease>\EndIncludeInRelease
    22 %
    23 <latexrelease>\IncludeInRelease{0000/00/00}{\@currpath}%
    24 <latexrelease> {Add \@currpath}%
    25 <latexrelease>\let\@currpath\@undefined
    26 <latexrelease>\EndIncludeInRelease
    27 </2kernel | latexrelease>
    28 <*2kernel>
    (End definition for \@currpath.)

\@currname Name of current package or option.
    29 \let\@currname\@empty
    (End definition for \@currname.)

\@currentx The current file extension.
    30 \global\let\@currentx=\@empty
    (End definition for \@currentx.)

\@clsextension The two possible values of \@currentx.
\@pkgextension 31 \def\@clsextension{cls}
    32 \def\@pkgextension{sty}

```

(End definition for \@clsextension and \@pkgextension.)

```

\@pushfilename Commands to push and pop the file name and extension.
\@popfilename #1 current name.
\@currnamestack #2 current extension.
                #3 current catcode of @.
                #4 Rest of the stack.
33 </2ekernel>
34 <*2ekernel | latexrelease>
35 <latexrelease>
36 <latexrelease>\IncludeInRelease{2020/10/01}{\@pushfilename}%
37 <latexrelease> {Add \@expl@push@filename@@ and \@expl@push@filename@aux@@}%
38 \def\@pushfilename{%

```

The push and pop macros are injected in \@pushfilename and \@popfilename so that they correctly keep track of the hook labels.

This needs cleanup with the expl3 interfaces also playing here, e.g., \@expl@push@filename@@ needs cleanup and (and should probably not have this name either).

```

39 \expl@push@filename@@
40 \xdef\@currnamestack{%
41   {\@currname}%
42   {\@currentxt}%
43   {\the\catcode'\@}%
44   \@currnamestack}%

```

Temporarily add a stack for \@currpath here. This should be integrated in the main file stack eventually, but other packages rely on \@currnamestack having three elements per file, so that isn't a trivial change. The prefix \@kernel@... hopefully discourages people from using it.

```

45 \xdef\@kernel@currpathstack{%
46   {\@currpath}%
47   \@kernel@currpathstack}%
48 \@expl@push@filename@aux@@}
49 <latexrelease>\EndIncludeInRelease

```

The following version of \@pushfilename didn't formally exist in this file, but in the 2020/02/02 release, expl3 was preloaded and it patched \@pushfilename (and \@popfilename) by adding some hooks in there. But rolling back to 2020/02/02, expl3 doesn't patch these macros again, so rolling back has to take those hooks into account. Same goes for \@popfilename.

```

50 <latexrelease>
51 <latexrelease>\IncludeInRelease{2020/02/02}{\@pushfilename}%
52 <latexrelease> {Add \@expl@push@filename@@}%
53 <latexrelease>\def\@pushfilename{%
54 <latexrelease> \@expl@push@filename@@
55 <latexrelease> \xdef\@currnamestack{%
56 <latexrelease>   {\@currname}%
57 <latexrelease>   {\@currentxt}%
58 <latexrelease>   {\the\catcode'\@}%
59 <latexrelease>   \@currnamestack}%
60 <latexrelease>   \@expl@push@filename@aux@@}
61 <latexrelease>\EndIncludeInRelease
62 <latexrelease>

```



When we roll back from a release that has `expl3` preloaded, the definitions of `\@pushfilename` and `\@popfilename` can't be completely rolled back otherwise `expl3`-based packages won't have the automatic `\ExplSyntaxOff` at the end. Here and below for `\@popfilename`, we don't roll back all the way through if coming from `LATEX > 2020-02-02`.

```

63 <latexrelease>\IncludeInRelease{0000/00/00}{\@pushfilename}%
64 <latexrelease> {Add \@expl@push@filename@@ and \@expl@push@filename@aux@@}%
65 <latexrelease>\ifnum\sourceLaTeXdate<20200202\relax
66 <latexrelease> \GenericInfo{}{Defining 00-00-00\string\@pushfilename.}
67 <latexrelease>\def\@pushfilename{%
68 <latexrelease> \xdef\@currnamestack{%
69 <latexrelease>   {\@currname}%
70 <latexrelease>   {\@currentxt}%
71 <latexrelease>   {\the\catcode'\@}%
72 <latexrelease>   \@currnamestack}}
73 <latexrelease>\else
74 <latexrelease> \GenericInfo{}{Defining 2020-02-02\string\@pushfilename.}
75 <latexrelease>\def\@pushfilename{%
76 <latexrelease> \expl@push@filename@@
77 <latexrelease> \xdef\@currnamestack{%
78 <latexrelease>   {\@currname}%
79 <latexrelease>   {\@currentxt}%
80 <latexrelease>   {\the\catcode'\@}%
81 <latexrelease>   \@currnamestack}%
82 <latexrelease>   \@expl@push@filename@aux@@}
83 <latexrelease>\fi
84 <latexrelease>\EndIncludeInRelease
85 \onlypreamble\@pushfilename

86 <latexrelease>
87 <latexrelease>\IncludeInRelease{2020/10/01}{\@popfilename}%
88 <latexrelease> {Add \@expl@pop@filename@@}%
89 \def\@popfilename{\@expl@@@hook@curr@name@pop@@
90   \expandafter\p@p@filename\@currnamestack\@nil

```

Same for popping:

```

91   \expandafter\p@p@filepath\@kernel@currpathstack\@nil
92   \@expl@pop@filename@@}
93 <latexrelease>\EndIncludeInRelease
94 <latexrelease>
95 <latexrelease>\IncludeInRelease{2020/02/02}{\@popfilename}%
96 <latexrelease> {Add \@expl@push@filename@@}%
97 <latexrelease>\def\@popfilename{\expandafter\p@p@filename\@currnamestack\@nil
98 <latexrelease> \@expl@pop@filename@@}
99 <latexrelease>\EndIncludeInRelease
100 <latexrelease>

101 <latexrelease>\IncludeInRelease{0000/00/00}{\@popfilename}%
102 <latexrelease> {Add \@expl@push@filename@@ and \@expl@push@filename@aux@@}%
103 <latexrelease>\ifnum\sourceLaTeXdate<20200202\relax
104 <latexrelease> \GenericInfo{}{Defining 00-00-00\string\@popfilename.}
105 <latexrelease>\def\@popfilename{\expandafter\p@p@filename\@currnamestack\@nil}
106 <latexrelease>\else
107 <latexrelease> \GenericInfo{}{Defining 2020-02-02\string\@popfilename.}

```

```

108 <latexrelease>\def\@popfilename{\expandafter\@p@pfilename\@currnamestack\@nil
109 <latexrelease> \@expl@pop@pfilename@@}
110 <latexrelease>\fi
111 <latexrelease>\EndIncludeInRelease
112 \@onlypreamble\@popfilename

113 </2ekernel | latexrelease>
114 <*2ekernel>

115 \def\@p@pfilename#1#2#3#4\@nil{%
116   \gdef\@currname{#1}%
117   \gdef\@currentx{#2}%
118   \catcode'\@#3\relax
119   \gdef\@currnamestack{#4}}
120 \@onlypreamble\@p@pfilename

121 \gdef\@currnamestack{}
122 \@onlypreamble\@currnamestack

```

(End definition for \@pushfilename, \@popfilename, and \@currnamestack.)

**\@kernel@currpathstack** Path to the current file if explicitly given. The auxiliary is needed here to insert a \@empty to prevent the loss of braces.

```

123 </2ekernel>
124 <*2ekernel | latexrelease>
125 <latexrelease>
126 <latexrelease>\IncludeInRelease{2020/10/01}{\@kernel@currpathstack}%
127 <latexrelease> {Add \@kernel@currpathstack}%

```

If rolling backwards to this release, \@kernel@currpathstack will be defined, so the \gdef line should not be executed, thus the \@gobblethree will take it out, so the satch isn't touched.

```

128 <latexrelease>\@ifundefined{kernel@currpathstack}{\@gobblethree}
129 \gdef\@kernel@currpathstack{}%

```

If rolling forward to this release, then the \gdef line above will define the path stack to be empty (which it can't be, inside a file), so the code below will traverse the \@currnamestack, and add as many empty items to \@kernel@currpathstack as there are items in \@currnamestack, so both are back in sync. Most of the time latexrelease is loaded on top-level, so only one item is needed, but platexrelease loads it internally, so the more complicated loop is needed.

```

130 <latexrelease>\ifx\@kernel@currpathstack\@empty
131 <latexrelease> \def\reserved@a#1#2#3{%
132 <latexrelease>   \ifx\relax#3\else
133 <latexrelease>     \g@addto@macro\@kernel@currpathstack{#3}%
134 <latexrelease>     \expandafter\reserved@a
135 <latexrelease>   \fi}%
136 <latexrelease> \expandafter\reserved@a\@currnamestack{#1}{\relax}%
137 <latexrelease>\fi
138 \def\@p@pfilepath#1{%
139   \gdef\@currpath{#1}\@p@pfilepath@aux\@empty}
140 \def\@p@pfilepath@aux#1\@nil{%
141   \xdef\@kernel@currpathstack{#1}}
142 <latexrelease>\EndIncludeInRelease
143 %
144 <latexrelease>\IncludeInRelease{0000/00/00}{\@kernel@currpathstack}%

```

```

145 <latexrelease> {Add \@kernel@currpathstack}%
146 <latexrelease>\let\@kernel@currpathstack\@undefined
147 <latexrelease>\let\@p@pfilepath\@undefined
148 <latexrelease>\let\@p@pfilepath@aux\@undefined
149 <latexrelease>\EndIncludeInRelease
150 </2ekernel | latexrelease>
151 <*2ekernel>

```

(End definition for \@kernel@currpathstack.)

**\@optionlist** Returns the option list of the file.

```

152 \def\@optionlist#1{%
153   \@ifundefined{opt@#1}\@empty{\csname opt@#1\endcsname}}
154 %\@onlypreamble\@optionlist

```

(End definition for \@optionlist.)

**\@ifpackageloaded** **\@ifclassloaded** **\@ifl@aded**{<name>} Checks to see whether a file has been loaded.

```

155 \def\@ifpackageloaded{\@ifl@aded\@pkgextension}
156 \def\@ifclassloaded{\@ifl@aded\@clsextension}

157 \def\@ifl@aded#1#2{%
158   \expandafter\ifx\csname ver@#2.#1\endcsname\relax
159     \expandafter\@secondoftwo
160   \else
161     \expandafter\@firstoftwo
162   \fi}

```

(End definition for \@ifpackageloaded and \@ifclassloaded.)

**\@ifpackagelater** **\@ifclasslater** **\@ifl@ter**{<name>}{YYYY/MM/DD}{<true code>}{<>false code>} Checks that the package loaded is more recent or equal to the given date. A better name for it would therefore be **\@ifpackagelaterorequal** but it is in use for more than 30 years, so ...

```

163 \def\@ifpackagelater{\@ifl@ter\@pkgextension}
164 \def\@ifclasslater{\@ifl@ter\@clsextension}

```

(End definition for \@ifpackagelater and \@ifclasslater.)

**\IfPackageAtLeastTF** **\IfClassAtLeastTF** **\IfFormatAtLeastTF**{YYYY/MM/DD}{<true code>}{<>false code>} Test if the format is later or equal to the given date.

```

165 </2ekernel>
166 <*2ekernel | latexrelease>
167 <latexrelease>\IncludeInRelease{2020/10/01}%
168 <latexrelease> { \IfFormatAtLeastTF}{Test format date}%
169 \def\IfFormatAtLeastTF{\@ifl@t@r\fmtversion}
170 \let\IfPackageAtLeastTF\@ifpackagelater
171 \let\IfClassAtLeastTF\@ifclasslater

```

For rollback pretend it was available since the beginning of dawn.

```

172 </2ekernel | latexrelease>
173 <latexrelease>\EndIncludeInRelease
174 <latexrelease>\IncludeInRelease{0000/00/00}%
175 <latexrelease> { \IfFormatAtLeastTF}{Test format date}%
176 <latexrelease>\def\IfFormatAtLeastTF{\@ifl@t@r\fmtversion}
177 <latexrelease>\let\IfPackageAtLeastTF\@ifpackagelater
178 <latexrelease>\let\IfClassAtLeastTF\@ifclasslater

```

```

179 <latexrelease>\EndIncludeInRelease
180 <*2ekernel>

(End definition for \IfPackageAtLeastTF, \IfClassAtLeastTF, and \IfFormatAtLeastTF.)

```

`\@ifl@ter`

```

181 \def\@ifl@ter#1#2{%
182   \expandafter\@ifl@t@r
183   \csname ver@#2.#1\endcsname}
184 </2ekernel>

This internal macro is also used in \NeedsTeXFormat.

185 <latexrelease>\IncludeInRelease{2018/04/01}%
186 <latexrelease>           {\@ifl@t@r}{Guard against bad input}%
187 <*2ekernel | latexrelease>
188 \def\@ifl@t@r#1#2{%
189   \ifnum\expandafter\@parse@version@#1//00\@nil<%
190     \expandafter\@parse@version@#2//00\@nil
191     \expandafter\@secondoftwo
192   \else
193     \expandafter\@firstoftwo
194   \fi}
195 \def\@parse@version@#1{\@parse@version0#1}
196 </2ekernel | latexrelease>
197 <latexrelease>\EndIncludeInRelease
198 <latexrelease>\IncludeInRelease{0000/00/00}%
199 <latexrelease>           {\@ifl@t@r}{Guard against bad input}%
200 <latexrelease>\def\@ifl@t@r#1#2{%
201 <latexrelease>   \ifnum\expandafter\@parse@version#1//00\@nil<%
202 <latexrelease>     \expandafter\@parse@version#2//00\@nil
203 <latexrelease>     \expandafter\@secondoftwo
204 <latexrelease>   \else
205 <latexrelease>     \expandafter\@firstoftwo
206 <latexrelease>   \fi}
207 <latexrelease>\let\@parse@version@\@undefined
208 <latexrelease>\EndIncludeInRelease
209 <*2ekernel>

(End definition for \@ifl@ter.)

210 </2ekernel>
211 <*2ekernel | latexreleasefirst>
212 \def\@parse@version#1/#2/#3#4#5\@nil{%
213   \@parse@version@dash#1-#2-#3#4\@nil
214 }

```

The `\if` test here ensures that an argument with no `/` or `-` produces 0 (actually 00).

```

215 \def\@parse@version@dash#1-#2-#3#4#5\@nil{%
216   \if\relax#2\relax\else#1\fi#2#3#4 }
217 </2ekernel | latexreleasefirst>
218 <*2ekernel>

```

`\@ifpackagewith` `\@ifpackagewith{<name>}{<option-list>}` Checks that `<option-list>` is a subset of the options **with** which `<name>` was loaded.

```

219 \def\@ifpackagewith{\@ifoptions\@pkgextension}
220 \def\@ifclasswith{\@ifoptions\@clsextension}

```

```

221 \def\@ifptions#1#2{%
222   \expandtwoargs\@ifpti@ns{\@optionlist{#2.#1}}
    Probably shouldn't use \CurrentOption here... (changed to \reserved@b.)
223 \</2ekernel>
224 \<latexrelease>\IncludeInRelease{2017/01/01}%
225 \<latexrelease>          {\@ifpti@ns}{Spaces in option clash check}%
226 \<*2ekernel | latexrelease>
227 \def\@ifpti@ns#1#2{%
228   \let\reserved@a\@firstoftwo
    \edef\reserved@b{\zap@space#2 \@empty}%
229   \@for\reserved@b:=\reserved@b\do{%
230     \ifx\reserved@b\@empty
231     \else
232       \expandafter\in@\expandafter{\expandafter,\reserved@b,}{, #1,}%
233       \ifin@
234       \else
235         \let\reserved@a\@secondoftwo
236       \fi
237     \fi
238   }%
239   \reserved@a}
240 \</2ekernel | latexrelease>
241 \<latexrelease>\EndIncludeInRelease
242 \<latexrelease>\IncludeInRelease{0000/00/00}%
243 \<latexrelease>          {\@ifpti@ns}{Spaces in option clash check}%
244 \<latexrelease>\def\@ifptions#1#2{%
245 \<latexrelease> \let\reserved@a\@firstoftwo
246 \<latexrelease> \@for\reserved@b:=#2\do{%
247 \<latexrelease> \ifx\reserved@b\@empty
248 \<latexrelease> \else
249 \<latexrelease> \expandafter\in@\expandafter
250 \<latexrelease>          {\expandafter,\reserved@b,}{, #1,}%
251 \<latexrelease> \ifin@
252 \<latexrelease> \else
253 \<latexrelease> \let\reserved@a\@secondoftwo
254 \<latexrelease> \fi
255 \<latexrelease> \fi
256 \<latexrelease> }%
257 \<latexrelease> \reserved@a}
258 \<latexrelease>\EndIncludeInRelease
259 \<*2ekernel>

```

(End definition for \ifpackagewith and \ifclasswith.)

\IfPackageLoadedTF More public names for the commands already available for a long time.

```

\IfPackageLoadedWithOptionsTF
\IfClassLoadedTF
\IfClassLoadedWithOptionsTF
261 \</2ekernel>
262 \<*2ekernel | latexrelease>
263 \<latexrelease>\IncludeInRelease{2021/11/15}%
264 \<latexrelease>          {\IfPackageLoadedTF}{Test package loading}%
265 \let \IfPackageLoadedTF          \@ifpackageloaded
266 \let \IfClassLoadedTF           \@ifclassloaded
267 \let \IfPackageLoadedWithOptionsTF \@ifpackagewith
268 \let \IfClassLoadedWithOptionsTF  \@ifclasswith

```

For rollback pretend it was available since the beginning of dawn.

```

269 </2ekernel | latexrelease>
270 <latexrelease>\EndIncludeInRelease
271 <latexrelease>\IncludeInRelease{0000/00/00}%
272 <latexrelease>          {\IfPackageLoadedTF}{Test package loading}%
273 <latexrelease>
274 <latexrelease>\let \IfPackageLoadedTF          \@ifpackageloaded
275 <latexrelease>\let \IfClassLoadedTF          \@ifclassloaded
276 <latexrelease>\let \IfPackageLoadedWithOptionsTF \@ifpackagewith
277 <latexrelease>\let \IfClassLoadedWithOptionsTF \@ifclasswith
278 <latexrelease>
279 <latexrelease>\EndIncludeInRelease
280 <*2ekernel>

```

(End definition for \IfPackageLoadedTF and others.)

**\ProvidesPackage** Checks that the current filename is correct, and defines \ver@filename.

```

281 </2ekernel>
282 <latexrelease>\IncludeInRelease{2020/10/01}%
283 <latexrelease> {\ProvidesPackage}{Check name with \strcmp}%
284 <*2ekernel | latexrelease>
285 \def\ProvidesPackage#1{%
286   \xdef\@gtempa{#1}%

```

Here \@currpath is explicitly added to the file name to report when a package or class is loaded using an explicit path. Loading using a path in the argument is supported but not encouraged.

```

287   \@expandtwoargs\@expl@str@if@eq@nnTF
288     {\@gtempa}{\@currpath\@currname}{}%
289   \@latex@warning@no@line{You have requested
290     \@cls@pkg\space'\@currpath\@currname',\MessageBreak
291     but the \@cls@pkg\space provides '#1'}%
292   }%
293   \@ifnextchar[\@pr@videpackage{\@pr@videpackage[]}]%
294   \@onlypreamble\ProvidesPackage
295 </2ekernel | latexrelease>
296 <latexrelease>\EndIncludeInRelease
297 %
298 <latexrelease>\IncludeInRelease{0000/00/00}%
299 <latexrelease> {\ProvidesPackage}{Undo: check name with \strcmp}%
300 <latexrelease>\def\ProvidesPackage#1{%
301 <latexrelease> \xdef\@gtempa{#1}%
302 <latexrelease> \ifx\@gtempa\@currname\else
303 <latexrelease>   \@latex@warning@no@line{You have requested
304 <latexrelease>     \@cls@pkg\space'\@currname',\MessageBreak
305 <latexrelease>     but the \@cls@pkg\space provides '#1'}%
306 <latexrelease> \fi
307 <latexrelease> \@ifnextchar[\@pr@videpackage{\@pr@videpackage[]}]%
308 <latexrelease>\EndIncludeInRelease
309 <*2ekernel>

```

(End definition for \ProvidesPackage.)

`\@pr@videpackage` This is the helper command for `\ProvidesPackage`. It tries to be cautious when handling the identification string in case it contains UTF-8 characters.

```

310 </2ekernel>
311 <*2ekernel | latexrelease>
312 <latexrelease>\IncludeInRelease{2020/10/01}%
313 <latexrelease>          {\@pr@videpackage}{Allow for package substitution}%
314 \def\@pr@videpackage[#1]{%
315   \expandafter\protected@xdef          %    <-- protected...
316     \csname ver@\@currname.\@current\endcsname{#1}% Loaded package
317   \expandafter\let
318     \csname ver@\@currpkg@reqd\expandafter\endcsname % Requested package
319     \csname ver@\@currname.\@current\endcsname
320   \ifx\@current\@clsextension
321     \typeout{Document Class: \@gtempa\space#1}%
322   \else
323     \protected@wlog{Package: \@gtempa\space#1}% <--- protected
324   \fi}

```

*(End definition for \@pr@videpackage.)*

`\protected@wlog` This is like plain T<sub>E</sub>X's `\wlog` but gracefully handles protected commands.

```

325 \long\def\protected@wlog#1{\begingroup
326   \set@display@protect
327   \immediate \write \m@ne {#1}\endgroup }

```

*(End definition for \protected@wlog.)*

```

328 </2ekernel | latexrelease>
329 <latexrelease>\EndIncludeInRelease
330 <latexrelease>\IncludeInRelease{2020/02/02}%
331 <latexrelease>          {\@pr@videpackage}{Protection for package info}%
332 <latexrelease>
333 <latexrelease>\def\@pr@videpackage[#1]{%
334 <latexrelease>   \expandafter\protected@xdef          %    <-- protected...
335 <latexrelease>     \csname ver@\@currname.\@current\endcsname{#1}%
336 <latexrelease>\ifx\@current\@clsextension
337 <latexrelease>   \typeout{Document Class: \@gtempa\space#1}%
338 <latexrelease>   \else
339 <latexrelease>     \protected@wlog{Package: \@gtempa\space#1}% <--- protected
340 <latexrelease>   \fi}
341 <latexrelease>
342 <latexrelease>\EndIncludeInRelease
343 <latexrelease>\IncludeInRelease{0000/00/00}%
344 <latexrelease>          {\@pr@videpackage}{Protection for package info}%
345 <latexrelease>
346 <latexrelease>\def\@pr@videpackage[#1]{%
347 <latexrelease>   \expandafter\xdef\csname ver@\@currname.\@current\endcsname{#1}%
348 <latexrelease>   \ifx\@current\@clsextension
349 <latexrelease>     \typeout{Document Class: \@gtempa\space#1}%
350 <latexrelease>   \else
351 <latexrelease>     \wlog{Package: \@gtempa\space#1}%
352 <latexrelease>   \fi}
353 <latexrelease>\let\protected@wlog\@undefined
354 <latexrelease>
355 <latexrelease>\EndIncludeInRelease
356 <*2ekernel>

```

357 \@@onlypreamble\@pr@videpackage

**\ProvidesClass** Like **\ProvidesPackage**, but for classes. This needs a dummy `latexrelease` block to copy the definition of **\ProvidesPackage** as it changes across releases.

```
358 \</2ekernel>
359 \<latexrelease>\IncludeInRelease{0000/00/00}%
360 \<latexrelease> \{\ProvidesClass\}{Track \ProvidesPackage}%
361 \<*2ekernel | latexrelease>
362 \let\ProvidesClass\ProvidesPackage
363 \@@onlypreamble\ProvidesClass
364 \</2ekernel | latexrelease>
365 \<latexrelease>\EndIncludeInRelease
366 \<*2ekernel>
```

(End definition for **\ProvidesClass**.)

**\ProvidesFile** Like **\ProvidesPackage**, but for arbitrary files. Do not apply **\@@onlypreamble** to these, as we may want to label files input during the document.

```
\@providesfile 367 \def\ProvidesFile#1{%
368   \begingroup
369   \catcode'\ 10 %
370   \ifnum \endlinechar<256 %
371     \ifnum \endlinechar>\m@ne
372       \catcode\endlinechar 10 %
373   \fi
374   \fi
375   \@makeother\/%
376   \@makeother\&%
377   \kernel@ifnextchar[{\@providesfile{#1}}{\@providesfile{#1}[]}]
```

During `initex` a special version of **\@providesfile** is used. The real definition is installed right at the end, in `ltfinal.dtx`.

```
def\@providesfile#1[#2]{%
  \wlog{File: #1 #2}%
  \expandafter\xdef\csname ver@#1\endcsname{#2}%
  \endgroup}
```

(End definition for **\ProvidesFile** and **\@providesfile**.)

**\PassOptionsToPackage** If the package has been loaded, we check that it was first loaded with the options.  
**\PassOptionsToClass** Otherwise we add the option list to that of the package.

```
378 \</2ekernel>
379 \<latexrelease>\IncludeInRelease{2021/06/01}%
380 \<latexrelease> \{\@pass@options\}{Raw option lists}%
381 \<*2ekernel | latexrelease>
382 \def\@pass@options#1#2#3{%
383   \@expl@@@filehook@set@curr@file@@nNN
384   {\@expl@@@filehook@resolve@file@subst@@w #3.#1\@nil}%
385   \reserved@a\reserved@b
386   \@expl@@@filehook@clear@replacement@flag@@
387   \expandafter\xdef\csname opt@\reserved@a\endcsname{%
```



```

388 \ifundefined{opt@\reserved@a}\@empty
389 {\csname opt@\reserved@a\endcsname,}%
390 \zap@space#2 \@empty}%

391 \expandafter\let
392 \csname opt@#3.#1\expandafter\endcsname
393 \csname opt@\reserved@a\endcsname

```

Extend raw option list

```

394 \ifundefined{@raw@opt@#3.#1}%
395 {\expandafter\gdef\csname @raw@opt@#3.#1\expandafter\endcsname
396 \expandafter{#2}}%
397 {\expandafter\g@addto@macro\csname @raw@opt@#3.#1\expandafter\endcsname
398 \expandafter{\expandafter,#2}}%
399 }
400 </2ekernel | latexrelease>
401 <latexrelease>\EndIncludeInRelease

402 <latexrelease>\IncludeInRelease{2020/10/01}{\@pass@options}
403 <latexrelease> {Add file replacement in \@pass@options}%
404 <latexrelease>
405 <latexrelease>\def\@pass@options#1#2#3{%
406 <latexrelease> \expl@@@filehook@set@curr@file@@nNN
407 <latexrelease> {\expl@@@filehook@resolve@file@subst@@w #3.#1\@nil}%
408 <latexrelease> \reserved@a\reserved@b
409 <latexrelease> \expl@@@filehook@clear@replacement@flag@@
410 <latexrelease> \expandafter\xdef\csname opt@\reserved@a\endcsname{%
411 <latexrelease> \ifundefined{opt@\reserved@a}\@empty
412 <latexrelease> {\csname opt@\reserved@a\endcsname,}%
413 <latexrelease> \zap@space#2 \@empty}%
414 <latexrelease> \expandafter\let
415 <latexrelease> \csname opt@#3.#1\expandafter\endcsname
416 <latexrelease> \csname opt@\reserved@a\endcsname}
417 <latexrelease>\EndIncludeInRelease

418 <latexrelease>\IncludeInRelease{0000/00/00}{\@pass@options}
419 <latexrelease> {\@pass@options}%
420 <latexrelease>
421 <latexrelease>\def\@pass@options#1#2#3{%
422 <latexrelease> \expandafter\xdef\csname opt@#3.#1\endcsname{%
423 <latexrelease> \ifundefined{opt@#3.#1}\@empty
424 <latexrelease> {\csname opt@#3.#1\endcsname,}%
425 <latexrelease> \zap@space#2 \@empty}}
426 <latexrelease>\EndIncludeInRelease
427 <*2ekernel>

428 \@onlypreamble\@pass@options

429 \def\PassOptionsToPackage{\@pass@options\@pkgextension}
430 \def\PassOptionsToClass{\@pass@options\@clsextension}
431 \@onlypreamble\PassOptionsToPackage
432 \@onlypreamble\PassOptionsToClass

```

(End definition for \PassOptionsToPackage and \PassOptionsToClass.)

**\DeclareOption** Adds an option as a \ds@ command, or the default \default@ds command.  
**\DeclareOption\*** 433 \def\DeclareOption{%

```

434 \let\@fileswith@pti@ns\@badrequireerror
435 \ifstar\@defdefault@ds\@declareoption}
436 \long\def\@declareoption#1#2{%
437 \xdef\@declaredoptions{\@declaredoptions,#1}%
438 \toks@{#2}%
439 \expandafter\edef\csname ds@#1\endcsname{\the\toks@}}
440 \long\def\@defdefault@ds#1{%
441 \toks@{#1}%
442 \edef\default@ds{\the\toks@}}
443 \onlypreamble\DeclareOption
444 \onlypreamble\@declareoption
445 \onlypreamble\@defdefault@ds

```

(End definition for \DeclareOption and \DeclareOption\*.)

**\OptionNotUsed** If we are in a class file, add \CurrentOption to the list of unused options. Otherwise, in  
**\@remove@eq@value** a package file do nothing.

```

446 </2ekernel>
447 <latexrelease>\IncludeInRelease{2021/06/01}%
448 <latexrelease> \OptionNotUsed}{filter unused option list}%
449 <*2ekernel | latexrelease>
450 \def\@remove@eq@value#1=#2\@nil{#1}
451 \def\OptionNotUsed{%
452 \ifx\@currentx\@clsextension
453 \xdef\@unusedoptionlist{%
454 \ifx\@unusedoptionlist\@empty\else\@unusedoptionlist,\fi
455 \expandafter\@remove@eq@value\CurrentOption=\@nil}%
456 \fi}
457 </2ekernel | latexrelease>
458 <latexrelease>\EndIncludeInRelease
459 <latexrelease>\IncludeInRelease{0000/00/00}%
460 <latexrelease> \OptionNotUsed}{filter unused option list}%
461 <latexrelease>\let\@remove@eq@value\undefined
462 <latexrelease>\def\OptionNotUsed{%
463 <latexrelease> \ifx\@currentx\@clsextension
464 <latexrelease> \xdef\@unusedoptionlist{%
465 <latexrelease> \ifx\@unusedoptionlist\@empty\else\@unusedoptionlist,\fi
466 <latexrelease> \CurrentOption}%
467 <latexrelease> \fi}
468 <latexrelease>\EndIncludeInRelease
469 <*2ekernel>
470 \onlypreamble\OptionNotUsed

```

(End definition for \OptionNotUsed and \@remove@eq@value.)

**\default@ds** The default option code. Set by \@onefilewithoptions to either \OptionNotUsed for  
classes, or \@unknownoptionerror for packages. This may be reset in either case with  
**\DeclareOption\***.

```

471 % \let\default@ds\OptionNotUsed

```

(End definition for \default@ds.)

`\ProcessOptions` `\ProcessOptions` calls `\ds@option` for each known package option, then calls `\default@ds` for each option on the local options list. Finally resets all the declared options to `\relax`. The empty option does nothing, this has to be reset on the off chance it's set to `\relax` if an empty element gets into the `\@declaredoptions` list.

The star form is similar but executes options given in the order specified in the document, not the order they are declared in the file. In the case of packages, global options are executed before local ones.

```

472 \def\ProcessOptions{%
473   \let\ds@\empty
474   \edef\@curroptions{\@optionlist{\@currname.\@currentx}}%
475   \@ifstar\@xprocessoptions\@processoptions}
476 \@onlypreamble\ProcessOptions

477 \def\@processoptions{%
478   \@for\CurrentOption:=\@declaredoptions\do{%
479     \ifx\CurrentOption\empty\else
480       \@expandtwoargs\in@{,\CurrentOption,}%
481       ,\ifx\@currentx\clsextension\else\@classoptionslist,\fi
482       \@curroptions,}%
483   \ifin@
484     \@useoption
485     \expandafter\let\csname ds@\CurrentOption\endcsname\empty
486   \fi
487   \fi}%
488 \@processoptions}
489 \@onlypreamble\@processoptions

490 </2ekernel>
491 <latexrelease>\IncludeInRelease{2021/06/01}%
492 <latexrelease>          {\@xprocessoptions}{safer \@xprocessoptions}%
493 <*2ekernel | latexrelease>
494 \def\@xprocessoptions{%
495   \ifx\@currentx\clsextension\else
496     \ifx\@classoptionslist\relax\else
497       \@for\CurrentOption:=\@classoptionslist\do{%
498         \ifx\CurrentOption\empty\else
499           \@ifundefined{ds@\CurrentOption}{\}%
500           \@useoption
501           \expandafter\let\csname ds@\CurrentOption\endcsname\empty
502         }%
503       \fi}%
504   \fi
505   \fi
506   \@processoptions}
507 </2ekernel | latexrelease>
508 <latexrelease>\EndIncludeInRelease
509 <latexrelease>\IncludeInRelease{0000/00/00}%
510 <latexrelease>          {\@xprocessoptions}{safer \@xprocessoptions}%
511 <latexrelease>\let\@remove@eq@value\@undefined

512 <latexrelease>\def\@xprocessoptions{%
513 <latexrelease>   \ifx\@currentx\clsextension\else
514 <latexrelease>     \@for\CurrentOption:=\@classoptionslist\do{%
515 <latexrelease>       \ifx\CurrentOption\empty\else

```

```

516 <latexrelease>      \@expandtwoargs\in@{,\CurrentOption,}{,\@declaredoptions,}%
517 <latexrelease>      \ifin@
518 <latexrelease>      \@use@option
519 <latexrelease>      \expandafter\let\csname ds@\CurrentOption\endcsname\@empty
520 <latexrelease>      \fi
521 <latexrelease>      \fi}%
522 <latexrelease>      \fi
523 <latexrelease>      \@process@pti@ns}
524 <latexrelease>\EndIncludeInRelease
525 <*2ekernel>

526 \onlypreamble\@xprocess@ptions

      The common part of \ProcessOptions and \ProcessOptions*.

527 </2ekernel>
528 <*2ekernel | latexrelease>
529 <latexrelease>\IncludeInRelease{2020/10/01}%
530 <latexrelease>      {\@process@ptions}{Unused options issue}%
531 \def\@process@ptions{%
532   \@for\CurrentOption:=\@curroptions\do{%
533     \@ifundefined{ds@\CurrentOption}%
534     {\@use@option
535      \default@ds}%
536     \@use@option}%

There should not be any non-empty definition of \CurrentOption at this point, as all the
declared options were executed earlier. This is for compatibility with 2.09 styles which use
\def\ds@... directly, and so have options which do not appear in \@declaredoptions.

537   \@use@option}%

Clear all the definitions for option code. First set all the declared options to \relax,
then reset the ‘default’ and ‘empty’ options. and the lst of declared options.

537   \@for\CurrentOption:=\@declaredoptions\do{%
538     \expandafter\let\csname ds@\CurrentOption\endcsname\relax}%

539   \let\CurrentOption\@empty
540   \let\@fileswith@ptions\@fileswith@ptions
541   \AtEndOfPackage{\expandafter\let
542     \csname unprocessedoptions-\@currname.\@current\endcsname
543     \relax}}
544 \onlypreamble\@process@ptions
545 </2ekernel | latexrelease>
546 <latexrelease>\EndIncludeInRelease
547 <latexrelease>\IncludeInRelease{0000/00/00}%
548 <latexrelease>      {\@process@ptions}{Unused options issue}%
549 <latexrelease>
550 <latexrelease>\def\@process@ptions{%
551 <latexrelease>   \@for\CurrentOption:=\@curroptions\do{%
552 <latexrelease>     \@ifundefined{ds@\CurrentOption}%
553 <latexrelease>       {\@use@option
554 <latexrelease>        \default@ds}%
555 <latexrelease>       \@use@option}%
556 <latexrelease>   \@for\CurrentOption:=\@declaredoptions\do{%
557 <latexrelease>     \expandafter\let\csname ds@\CurrentOption\endcsname\relax}%
558 <latexrelease>   \let\CurrentOption\@empty
559 <latexrelease>   \let\@fileswith@ptions\@fileswith@ptions
560 <latexrelease>   \AtEndOfPackage{\let\unprocessedoptions\relax}}

```

```

561 <latexrelease>\EndIncludeInRelease
562 <*2ekernel>

(End definition for \ProcessOptions and \ProcessOptions*.)

```

**\@options** \@options is a synonym for \ProcessOptions\* for upward compatibility with L<sup>A</sup>T<sub>E</sub>X 2.09 style files.

```

563 \def\@options{\ProcessOptions*}
564 \@onlypreamble\@options

(End definition for \@options.)

```

**\@use@option** Execute the code for the current option.

```

565 </2ekernel>
566 <latexrelease>\IncludeInRelease{2021/06/01}%
567 <latexrelease>          {\@use@option}{filter unused option list}%
568 <*2ekernel | latexrelease>
569 \def\@use@option{%
570   \@expandtwoargs\@removeelement
571     {\expandafter\@remove@eq@value\CurrentOption=\@nil}%
572   \@unusedoptionlist\@unusedoptionlist
573   \csname ds@\CurrentOption\endcsname}
574 </2ekernel | latexrelease>
575 <latexrelease>\EndIncludeInRelease
576 <latexrelease>\IncludeInRelease{0000/00/00}%
577 <latexrelease>          {\@use@option}{filter unused option list}%
578 <latexrelease>\def\@use@option{%
579 <latexrelease>   \@expandtwoargs\@removeelement\CurrentOption
580 <latexrelease>   \@unusedoptionlist\@unusedoptionlist
581 <latexrelease>   \csname ds@\CurrentOption\endcsname}
582 <latexrelease>\EndIncludeInRelease
583 <*2ekernel>

584 \@onlypreamble\@use@option

(End definition for \@use@option.)

```

**\ExecuteOptions** \ExecuteOptions{<option-list>} executes the code declared for each option.

```

585 </2ekernel>
586 <latexrelease>\IncludeInRelease{2017/01/01}%
587 <latexrelease>          {\ExecuteOptions}{Spaces in \ExecuteOptions}%
588 <*2ekernel | latexrelease>
589 \def\ExecuteOptions#1{%

```

Use \@fortmp here as it is anyway cleared during \@for loop so does not change any existing names.

```

590   \edef\@fortmp{\zap@space#1 \@empty}%
591   \def\reserved@a##1\@nil{%
592     \@for\CurrentOption:=\@fortmp\do
593       {\csname ds@\CurrentOption\endcsname}%
594     \edef\CurrentOption{##1}}%
595   \expandafter\reserved@a\CurrentOption\@nil}
596 </2ekernel | latexrelease>
597 <latexrelease>\EndIncludeInRelease
598 <latexrelease>\IncludeInRelease{0000/00/00}%

```

```

599 <latexrelease>          {\ExecuteOptions}{Spaces in \ExecuteOptions}%
600 <latexrelease>\def\ExecuteOptions#1{%
601 <latexrelease>  \def\reserved@a##1\@nil{%
602 <latexrelease>    \for\CurrentOption:=#1\do
603 <latexrelease>      {\csname ds@\CurrentOption\endcsname}%
604 <latexrelease>    \edef\CurrentOption{##1}}%
605 <latexrelease>  \expandafter\reserved@a\CurrentOption\@nil}
606 <latexrelease>\EndIncludeInRelease
607 <*2ekernel>

```

```

608 \@onlypreamble\ExecuteOptions

```

*(End definition for \ExecuteOptions.)*

The top-level commands, which just set some parameters then call the internal command, \@fileswithoptions.

**\documentclass** The main new-style class declaration.

```

609 \def\documentclass{%
610   \let\documentclass\@twoclasseserror
611   \if@compatibility\else\let\usepackage\RequirePackage\fi
612   \@fileswithoptions\@clsextension}
613 \@onlypreamble\documentclass

```

*(End definition for \documentclass.)*

**\documentstyle** 2.09 style class ‘style’ declaration.

```

614 \def\documentstyle{%
615   \makeatletter\input{latex209.def}\makeatother
616   \documentclass}
617 \@onlypreamble\documentstyle

```

*(End definition for \documentstyle.)*

**\RequirePackage** Load package if not already loaded.

```

618 \def\RequirePackage{%
619   \@fileswithoptions\@pkgextension}
620 \@onlypreamble\RequirePackage

```

*(End definition for \RequirePackage.)*

**\LoadClass** Load class.

```

621 \def\LoadClass{%
622   \ifx\@current\@pkgextension
623     \@latex@error
624     {\noexpand\LoadClass in package file}%
625     {You may only use \noexpand\LoadClass in a class file.}%
626   \fi
627   \@fileswithoptions\@clsextension}
628 \@onlypreamble\LoadClass

```

*(End definition for \LoadClass.)*

`\loadwithoptions` Pass the current option list on to a class or package. #1 is `\@cls-or-pkgextension`, #2 is `\RequirePackage` or `\LoadClass`, #3 is the class or package to be loaded.

```

629 \</2ekernel>
630 \<latexrelease>\IncludeInRelease{2021/06/01}%
631 \<latexrelease>          {\@loadwithoptions}{Raw option lists load with options}%
632 \<*2ekernel | latexrelease>
633 \def\@loadwithoptions#1#2#3{%
634   \expandafter\let\csname opt@#3.#1\expandafter\endcsname
635     \csname opt@ \@currname.\@currentx\endcsname
636   \expandafter\let\csname @raw@opt@#3.#1\expandafter\endcsname
637     \csname @raw@opt@ \@currname.\@currentx\endcsname
638     #2{#3}}
639 \</2ekernel | latexrelease>
640 \<latexrelease>\EndIncludeInRelease

641 \<latexrelease>\IncludeInRelease{0000/00/00}
642 \<latexrelease>          {\@loadwithoptions}{Raw option lists load with options}%
643 \<latexrelease>\def\@loadwithoptions#1#2#3{%
644 \<latexrelease>   \expandafter\let\csname opt@#3.#1\expandafter\endcsname
645 \<latexrelease>     \csname opt@ \@currname.\@currentx\endcsname
646 \<latexrelease>     #2{#3}}
647 \<latexrelease>\EndIncludeInRelease
648 \<*2ekernel>

649 \<@onlypreamble>\@loadwithoptions

(End definition for \@loadwithoptions.)

```

`\LoadClassWithOptions` Load class ‘#1’ with the current option list.

```

650 \def\LoadClassWithOptions{%
651   \@loadwithoptions\@clsextension\LoadClass}
652 \<@onlypreamble>\LoadClassWithOptions

(End definition for \LoadClassWithOptions.)

```

`\RequirePackageWithOptions` Load package ‘#1’ with the current option list.

```

653 \</2ekernel>
654 \<*2ekernel | latexrelease>
655 \<latexrelease>\IncludeInRelease{2020/10/01}%
656 \<latexrelease>          {\RequirePackageWithOptions}{Unused options issue}%
657 \def\RequirePackageWithOptions{%

```

The resetting of the unprocessed options is now done on a par package basis.

```

658   \AtEndOfPackage{\expandafter\let
659     \csname unprocessedoptions-\@currname.\@currentx\endcsname
660     \relax}%
661   \@loadwithoptions\@pkgextension\RequirePackage}
662 \<@onlypreamble>\RequirePackageWithOptions
663 \</2ekernel | latexrelease>
664 \<latexrelease>\EndIncludeInRelease

665 \<latexrelease>\IncludeInRelease{0000/00/00}%
666 \<latexrelease>          {\RequirePackageWithOptions}{Unused options issue}%
667 \<latexrelease>
668 \<latexrelease>\def\RequirePackageWithOptions{%
669 \<latexrelease>   \AtEndOfPackage{\let\unprocessedoptions\relax}%

```

```

670 <latexrelease> \loadwithoptions\@pkgextension\RequirePackage}
671 <latexrelease>\EndIncludeInRelease
672 <*2ekernel>

```

(End definition for \RequirePackageWithOptions.)

**\usepackage** To begin with, \usepackage produces an error. This is reset by \documentclass.

```

673 \def\usepackage#1{%
674   \latex@error
675     {\noexpand \usepackage before \string\documentclass}%
676     {\noexpand \usepackage may only appear in the document
677      preamble, i.e.,\MessageBreak
678      between \noexpand\documentclass and
679      \string\begin{document}.}%
680   \@gobble}
681 \@onlypreamble\usepackage

```

(End definition for \usepackage.)

**\NeedsTeXFormat** Check that the document is running on the correct system.

```

682 \def\NeedsTeXFormat#1{%
683   \def\reserved@a{#1}%
684   \ifx\reserved@a\fmtname
685     \expandafter\@needsformat
686   \else
687     \latex@error{This file needs format ‘\reserved@a’%
688       \MessageBreak but this is ‘\fmtname’}%{
689       The current input file will not be processed
690       further,\MessageBreak
691       because it was written for some other flavor of
692       TeX.\MessageBreak\@ehd}%

```

If the file is not meant to be processed by L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> we stop inputting it, but we do not end the run. We just end inputting the current file.

```

693   \endinput \fi}
694 \@onlypreamble\NeedsTeXFormat

695 \def\@needsformat{%
696   \@ifnextchar[%
697     \@needsformat
698   {}
699 \@onlypreamble\@needsformat

700 \def\@needsformat[#1]{%
701   \ifl@t@r\fmtversion{#1}{}%
702   {\@latex@warning@no@line
703     {You have requested release ‘#1’ of LaTeX,\MessageBreak
704     but only release ‘\fmtversion’ is available}}
705 \@onlypreamble\@needsformat

```

(End definition for \NeedsTeXFormat.)

**\zap@space** \zap@space foo<space>\@empty removes all spaces from foo that are not protected by { } groups.

```

706 \def\zap@space#1 #2{%
707   #1%

```



```

708 \ifx#2\@empty\else\expandafter\zap@space\fi
709 #2}

```

(End definition for \zap@space.)

\@fileswithoptions The common part of \documentclass and \usepackage.

```

710 \def\@fileswithoptions#1{%
711 \ifnextchar[%
712 {\@fileswithoptions#1}%
713 {\@fileswithoptions#1[]}}
714 \@onlypreamble\@fileswithoptions

715 \def\@fileswithoptions#1[#2]#3{%
716 \ifnextchar[%
717 {\@fileswithoptions#1[#{2}]#3}%
718 {\@fileswithoptions#1[#{2}]#3[]}}
719 \@onlypreamble\@fileswithoptions

```

Then we do some work.

First of all, we define the global variables. Then we look to see if the file has already been loaded. If it has, we check that it was first loaded with at least the current options. If it has not, we add the current options to the package options, set the default version to be 0000/00/00, and load the file if we can find it. Then we check the version number.

Finally, we restore the old file name, reset the default option, and we set the catcode of @.

For classes, we can immediately process the file. For other types, #2 could be a comma separated list, so loop through, processing each one separately.

```

720 </2ekernel>
721 <latexrelease>\IncludeInRelease{2020/10/01}%
722 <latexrelease> {\@fileswithoptions}{ifx tests in \@fileswithoptions}%
723 <*2ekernel | latexrelease>
724 \def\@fileswithoptions#1[#2]#3[#4]{%
725 \ifx#1\@clsextension
726 \ifx\@classoptionslist\relax
727 \xdef\@classoptionslist{\zap@space#2 \@empty}%

```

Save raw class list.

```

728 \gdef\@raw@classoptionslist{#2}%
729 \def\reserved@a{%
730 \@onefilewithoptions#3[#{2}][#{4}]#1%
731 \@documentclasshook}%
732 \else
733 \def\reserved@a{%
734 \@onefilewithoptions#3[#{2}][#{4}]#1%
735 \fi
736 \else

```

build up a list of calls to \@onefilewithoptions (one for each package) without thrashing the parameter stack.

```

737 \def\reserved@b##1,{%

```

If #1 is \@nnil we have reached the end of the list (older version used \@nil here but \@nil is undefined so \ifx equal to all undefined commands)

```

738 \ifx\@nnil##1\relax\else

```

If `\ifx\@nnil##1\@nnil` is true then #1 is (presumably) empty (Older code used `\relax` which is slightly easier to get into #1 by mistake, which would spoil this test.)

```

739     \ifx\@nnil##1\@nnil\else

740         \noexpand\@onefilewithoptions##1[{\unexpanded{#2}}][{#4}]%
741         \noexpand\@pkgextension
742     \fi
743     \expandafter\reserved@b
744 \fi}%
745 \edef\reserved@a{\zap@space#3 \@empty}%
746 \edef\reserved@a{\expandafter\reserved@b\reserved@a,\@nnil,}%
747 \fi
748 \reserved@a}
749 \</2ekernel | latexrelease>
750 \<latexrelease>\EndIncludeInRelease
751 \<latexrelease>\IncludeInRelease{2017/01/01}%
752 \<latexrelease>    {\@fileswith@pti@ns}{ifx tests in \@fileswith@pti@ns}%
753 \<latexrelease>\def\@fileswith@pti@ns#1[#2]#3[#4]{%
754 \<latexrelease>    \ifx#1\@clsextension
755 \<latexrelease>        \ifx\@classoptionslist\relax
756 \<latexrelease>            \xdef\@classoptionslist{\zap@space#2 \@empty}%
757 \<latexrelease>            \def\reserved@a{%
758 \<latexrelease>                \@onefilewithoptions#3[{#2}][{#4}]#1%
759 \<latexrelease>                \@documentclasshook}%
760 \<latexrelease>        \else
761 \<latexrelease>            \def\reserved@a{%
762 \<latexrelease>                \@onefilewithoptions#3[{#2}][{#4}]#1%
763 \<latexrelease>        \fi
764 \<latexrelease>    \else
765 \<latexrelease>        \def\reserved@b##1,{%
766 \<latexrelease>            \ifx\@nnil##1\relax\else
767 \<latexrelease>                \ifx\@nnil##1\@nnil\else
768 \<latexrelease>                    \noexpand\@onefilewithoptions##1[{#2}][{#4}]%
769 \<latexrelease>                    \noexpand\@pkgextension
770 \<latexrelease>                \fi
771 \<latexrelease>                \expandafter\reserved@b
772 \<latexrelease>            \fi}%
773 \<latexrelease>            \edef\reserved@a{\zap@space#3 \@empty}%
774 \<latexrelease>            \edef\reserved@a{\expandafter\reserved@b\reserved@a,\@nnil,}%
775 \<latexrelease>        \fi
776 \<latexrelease>    \reserved@a}
777 \<latexrelease>\EndIncludeInRelease
778 \<latexrelease>\IncludeInRelease{0000/00/00}%
779 \<latexrelease>    {\@fileswith@pti@ns}{ifx tests in \@fileswith@pti@ns}%
780 \<latexrelease>\def\@fileswith@pti@ns#1[#2]#3[#4]{%
781 \<latexrelease>    \ifx#1\@clsextension
782 \<latexrelease>        \ifx\@classoptionslist\relax
783 \<latexrelease>            \xdef\@classoptionslist{\zap@space#2 \@empty}%
784 \<latexrelease>            \def\reserved@a{%
785 \<latexrelease>                \@onefilewithoptions#3[{#2}][{#4}]#1%
786 \<latexrelease>                \@documentclasshook}%
787 \<latexrelease>        \else
788 \<latexrelease>            \def\reserved@a{%
789 \<latexrelease>                \@onefilewithoptions#3[{#2}][{#4}]#1%

```

```

790 <latexrelease> \fi
791 <latexrelease> \else
792 <latexrelease> \def\reserved@b##1,{%
793 <latexrelease> \ifx\@nil##1\relax\else
794 <latexrelease> \ifx\relax##1\relax\else
795 <latexrelease> \noexpand\@onefilewithoptions##1[#{#2}][#{#4}]%
796 <latexrelease> \noexpand\@pkgextension
797 <latexrelease> \fi
798 <latexrelease> \expandafter\reserved@b
799 <latexrelease> \fi}%
800 <latexrelease> \edef\reserved@a{\zap@space#3 \@empty}%
801 <latexrelease> \edef\reserved@a{%
802 <latexrelease> \expandafter\reserved@b\reserved@a,\@nil,}%
803 <latexrelease> \fi
804 <latexrelease> \reserved@a}
805 <latexrelease>\EndIncludeInRelease
806 <*2ekernel>
807 \@onlypreamble\@fileswith@ptions

```

This macro is used when loading packages or classes.

`\load@onefilewithoptions` Have the main argument as #1, so we only need one `\expandafter` above.

```

808 </2ekernel>
809 <*2ekernel | latexrelease>
810 <latexrelease>\IncludeInRelease{2020/10/01}%
811 <latexrelease> \{\@onefilewithoptions\}{Hooks and unused options issue}%
812 \def\@onefilewithoptions#1[#2][#3]#4{%

```

We have to sanitise file names, so that something like

```

\usepackage{some/local/path/array}
\usepackage{array}

```

won't load `array.sty` twice. It is remotely possible that those are two different files, but as a matter of principles, we will consider that the base file name uniquely identifies a package, regardless of where it lives. This assumption already holds for file hooks, for example, which address the hook to a file by its base name only.

We'll use `\@expl@@@filehook@set@curr@file@nNN{#1.#4}\reserved@a\reserved@b` to parse the file name and return the `<path>` and `<base+ext>` in separate token lists. Further ahead, most operations use `\@currname` which doesn't have a path attached to it; only few actions prepend `\@currpath` to `\@currname` (namely loading, as we have to respect the given path).

A file substitution isn't followed just yet because at this point we are parsing user input, so the file is still what the user asked for, and not the file actually loaded.

```

813 \@expl@@@filehook@set@curr@file@nNN{#1.#4}\reserved@a\reserved@b
814 \edef\reserved@c{\def\noexpand\reserved@c####1%
815 \detokenize\expandafter{\expanded{.#4}}}%
816 \noexpand\@nil{\def\noexpand\reserved@a{####1}}\reserved@c
817 \expandafter\reserved@c\reserved@a\@nil
818 \@pushfilename
819 \xdef\@currname{\string@makeletter\reserved@a}%
820 \xdef\@currpath{\ifx\reserved@b\@empty\else\reserved@b\fi}%
821 \global\let\@current#4%

```

The command `\ver@<file>.<ext>` is used to signal that a package is already loaded, either because it is in fact loaded, or because its loading was suppressed. In minimal installations, said package may not exist but still have its loading suppressed with `\ver@<file>.<ext>`, so before checking if the file exists we have to check that we do need to load it with `\@ifl@aded`. If we don't, then there's no point in checking for a typo or load-disabling.

```
822 \@ifl@aded\@current\@currname
```

In the current preferred approach, a key family name will exist for processing using `ltkeys`. In that case, we replace the previous package options with the new ones, then call the key handler. Otherwise, we use the more classical clash handler.

```
823 {%
824 \ifundefined{opt@fam@\@currname.\@current}
825 {\@onefilewithoptions@clashchk{#2}}
826 {%
827 \expandafter\edef\csname opt@\@currname.\@current\endcsname
828 {\zap@space#2 \@empty}%
829 \@namedef{@raw@opt@\@currname.\@current}{#2}%
830 \expandafter\expandafter\expandafter\ProcessKeyOptions
831 \expandafter\expandafter\expandafter
832 [\csname opt@fam@\@currname.\@current\endcsname]%
833 }%
834 }%
835 {\makeatletter
```

The next line seems to be necessary for 2.09 compatibility (the way the code is written there) This seems questionable and should be look at as in 2e it is definitely unnecessary at this point!

```
836 \@reset@ptions
```

First we take the `<name>` and `<ext>` given in the argument and check if the file exists, and issue an error otherwise asking for a correction with `\@missingfileerror`. For checking if the file exists we use `\@currpath` (usually empty) before `\@currname`.

```
837 \IfFileExists{\@currpath\@currname.\@current}{}%
838 {\@missing@onefilewithoptions{#2}}%
```

If `\@currname` is empty (the user replied to the “Enter file name” prompt with `<RETURN>`), so stop here (do `\@popfilename` to pop the item just added above).

This `\@gobble` omits the date check at the end.

```
839 \ifx\@currname\@empty
840 \expandafter\@gobble
841 \else
```

If the file exists, check if it was load-prevented, and otherwise do the bookkeeping with `\@filehook@file@push` then call `\set@curr@file` to set `\@curr@file` (and do any required substitution), then actually load the class/package with `\load@onefile@withoptions`. `\set@curr@file` also needs the file path.

```
842 \@disable@packageload@do{\@currname.\@current}%
843 {\@expl@@@filehook@file@push@@
844 \set@curr@file{\@currpath\@currname.\@current}%
845 \@filehook@set@CurrentFile
```

The `\set@curr@file` line above might have replaced the file, so `\@currname` and `\@currentx` may no longer hold the actual package being loaded, so in that case we need to update these two token lists (`\@curr@file` holds the file name after replacement, so we parse that).

The requested file is saved in `\@currpkg@reqd` to be used in `\InputIfFileExists` later: if the updated `\@currname` and `\@currentx` are used we lose track of the substitution, so `\CurrentFile` and `\CurrentFileUsed` will be (incorrectly) the same.

```
846         \expandafter\@swaptwoargs\expandafter
847         {\expandafter{\@currpkg@reqd}}%
848         {% <
```

`\@currpkg@reqd` doesn't take a path because it is used later to assign `\opt@...` and `\ver@...`

```
849         \edef\@currpkg@reqd{\@currname.\@currentx}%
850         \ifx\CurrentFile\CurrentFileUsed
851         \else
852         \filename@parse\@curr@file
853         \edef\@currpath{\string@makeletter\filename@area}%
854         \edef\@currname{\string@makeletter\filename@base}%
855         \edef\@currentx{\string@makeletter\filename@ext}%
856         \fi
857         \load@onefile@withoptions{#2}%
858         \def\@currpkg@reqd%\@currpkg@reqd%
859         }% >
```

Now just clean up and exit.

```
860         \expl@@@filehook@file@pop@@}%
861         \expandafter\@firstofone
862         \fi}%
```

Except in the case where `\@currname` is empty, the date is checked against the date marked in the package file:

```
863         {\@ifl@ter\@currentx{\@currname}{#3}{}}%
864         {\@latex@warning@no@line
865         {You have requested,\on@line,
866         version\MessageBreak
867         ‘#3’ of \@cls@pkg\space \@currname,\MessageBreak
868         but only version\MessageBreak
869         ‘\csname ver@\@currname.\@currentx\endcsname’\MessageBreak
870         is available}}}%
871         \ifx\@currentx\@clsextension\let\LoadClass\@twoloadclasserror\fi}%
872         \@popfilename
873         \@reset@options}
```

If the package is already loaded, check that there were no option clashes.

```
874 \def\@onefilewithoptions@clashchk#1{%
\@onefilewithoptions@clashchk
875 \@if@options\@currentx{\@currname}{#1}{}}%
876 {\@latex@error
877 {Option clash for \@cls@pkg\space \@currname}%
878 {The package \@currname\space has already been loaded
879 with options:\MessageBreak
880 \space\space[\@optionlist{\@currname.\@currentx}]\MessageBreak
881 There has now been an attempt to load it
```

```

882         with options\MessageBreak
883         \space\space[#1]\MessageBreak
884         Adding the global options:\MessageBreak
885         \space\space
886         \optionlist{\@currname.\@current},#1\MessageBreak
887         to your \noexpand\documentclass declaration may fix this.%
888         \MessageBreak
889         Try typing \space <return> \space to proceed.}}%
890     \@firstofone}

```

```

891 \let\@currpkg@reqd\@empty
892 \@onlypreamble\@onefilewithoptions
      The kernel no longer uses \@unprocessedoptions
893 \let\@unprocessedoptions\@undefined

```

Now the action taken when a file is not found. Path must be included here as it eventually leads to a file lookup.

```

894 \def\@missing@onefilewithoptions#1{%
895     \@missingfileerror{\@currpath\@currname}\@current
896     \global\let\@currpath\@missingfile@area
897     \global\let\@currname\@missingfile@base
898     \global\let\@current\@missingfile@ext}

```

Now the code that actually does the file loading:

```

899 \def\load@onefile@withoptions#1{%
900     \let\CurrentOption\@empty
901     \@reset@options

```

Grab everything in a macro, so the parameter stack is popped before any processing begins.

```

902     \def\reserved@a{%
903         \@pass@options\@current{#1}{\@currname}%
904
905         \expandafter\let
906         \csname opt@\@currpkg@reqd\expandafter\endcsname
907         \csname opt@\@currname.\@current\endcsname
908         \expandafter\let
909         \csname @raw@opt@\@currpkg@reqd\expandafter\endcsname
910         \csname @raw@opt@\@currname.\@current\endcsname
911         \global\expandafter
912         \let\csname ver@\@currname.\@current\endcsname\@empty

```

We initialize \dots-h@@k here and only if we load the file so that it remains undefined otherwise.

```

912     \expandafter\let\csname\@currname.\@current-h@@k\endcsname\@empty

```

When the current extension is \@pkgextension we are loading a package otherwise, if it is \@clsextension, a class, so depending on that we execute different hooks. If the extension is neither, then it is another type of file without special hooks.

```

913 %-----
914     \ifx\@current\@pkgextension
915         \UseHook{package/before}%
916         \UseOneTimeHook{package/\@currname/before}%
917     \else

```

```

918 \ifx\@currentx\@clsextension
919 \UseHook{class/before}%
920 \UseOneTimeHook{class/\@currname/before}%
921 \fi
922 \fi

```

Now actually load the file (at this point we are certain it exists, but use `\InputIfFileExists` so that file hooks are executed). `\@currpath` is needed here too.

```

923 \InputIfFileExists{\@currpath\@currpkg@reqd}{}%
924 {\@latex@error
925 {The \@cls@pkg\space\@currpkg@reqd\space failed to load}\@ehd}%
926 %-----

```

In older versions of the code `\@unprocessedoptions` would generate an error for each specified option in a package unless a `\ProcessOptions` has appeared in the package file.

This has changed in 2020. We now use a separate macro per package to avoid interference in case of nested packages. The whole code for handling this issue (GitHub 22) was provided by Hironobu Yamashita, thanks for that.

```

927 \expandafter\let\csname unprocessedoptions-\@currname.\@currentx\endcsname
928 \@@unprocessedoptions
929 \csname\@currname.\@currentx-h@@k\endcsname
930 \expandafter\let\csname\@currname.\@currentx-h@@k\endcsname
931 \undefined

```

Catch the case where the packages has handled the options and redefined `\@unprocessedoptions` to `\relax` (old interface). In that case no error should be produced.

```

932 \ifx\@unprocessedoptions\relax
933 \let\@unprocessedoptions\undefined

```

Otherwise run the per package set of unused options.

```

934 \else
935 \csname unprocessedoptions-\@currname.\@currentx\endcsname
936 \fi

```

In either case we drop the macro afterwards as it is no longer needed.

```

937 \expandafter\let
938 \csname unprocessedoptions-\@currname.\@currentx\endcsname
939 \undefined

```

And same procedure, James, when we are finished loading, except that the hook order is now reversed.

```

940 %-----
941 \ifx\@currentx\@pkgextension
942 \UseOneTimeHook{package/\@currname/after}%
943 \UseHook{package/after}%
944 \else
945 \ifx\@currentx\@clsextension
946 \UseOneTimeHook{class/\@currname/after}%
947 \UseHook{class/after}%
948 \fi
949 \fi}%
950 %-----
951 \@ifl@aded\@currentx\@currname{}\{\reserved@a}\}

```

Now declare the non-generic package and class hooks used above:

```

952 \NewHook{package/before}
953 \NewHook{class/before}
954 \NewReversedHook{package/after}
955 \NewReversedHook{class/after}

956 </2ekernel | latexrelease>
957 <latexrelease>\EndIncludeInRelease
958 <latexrelease>\IncludeInRelease{0000/00/00}%
959 <latexrelease>      {\@onefilewithoptions}{Hooks and unused options issue}%
960 <latexrelease>

```

Because of the way \@onefilewithoptions is changed for rollback handling below we have to define \load@onefilewithoptions when rolling back!

```

961 <latexrelease>\def\load@onefilewithoptions#1[#2][#3]#4{%
962 <latexrelease>  \pushfilename
963 <latexrelease>  \xdef\@currname{#1}%
964 <latexrelease>  \global\let\@currentx#4%
965 <latexrelease>  \let\CurrentOption\@empty
966 <latexrelease>  \@reset@ptions
967 <latexrelease>  \makeatletter
968 <latexrelease>  \def\reserved@a{%
969 <latexrelease>    \ifl@aded\@currentx{#1}%
970 <latexrelease>    {\@if@ptions\@currentx{#1}{#2}{}}%
971 <latexrelease>    {\@latex@error
972 <latexrelease>      {Option clash for \cls@pkg\space #1}%
973 <latexrelease>      {The package #1 has already been loaded
974 <latexrelease>        with options:\MessageBreak
975 <latexrelease>        \space\space[\@optionlist{#1.\@currentx}]\MessageBreak
976 <latexrelease>        There has now been an attempt to load it
977 <latexrelease>        with options:\MessageBreak
978 <latexrelease>        \space\space[#2]\MessageBreak
979 <latexrelease>        Adding the global options:\MessageBreak
980 <latexrelease>        \space\space
981 <latexrelease>        \@optionlist{#1.\@currentx},#2\MessageBreak
982 <latexrelease>        to your \noexpand\documentclass declaration may fix this.%
983 <latexrelease>        \MessageBreak
984 <latexrelease>        Try typing \space <return> \space to proceed.}}}%
985 <latexrelease>    {\@pass@ptions\@currentx{#2}{#1}%
986 <latexrelease>    \global\expandafter
987 <latexrelease>    \let\csname ver@\@currname.\@currentx\endcsname\@empty
988 <latexrelease>    \expandafter\let\csname\@currname.\@currentx-h@@k\endcsname\@empty
989 <latexrelease>    \InputIfFileExists
990 <latexrelease>    {\@currname.\@currentx}%
991 <latexrelease>    {}%
992 <latexrelease>    {\@missingfileerror\@currname\@currentx}%
993 <latexrelease>    \let\@unprocessedoptions\@unprocessedoptions
994 <latexrelease>    \csname\@currname.\@currentx-h@@k\endcsname
995 <latexrelease>    \expandafter\let\csname\@currname.\@currentx-h@@k\endcsname
996 <latexrelease>    \undefined
997 <latexrelease>    \@unprocessedoptions}%
998 <latexrelease>    \ifl@ter\@currentx{#1}{#3}{}}%
999 <latexrelease>    {\@latex@warning@no@line
1000 <latexrelease>      {You have requested,\on@line,

```



```

1001 <latexrelease>          version\MessageBreak
1002 <latexrelease>          ‘#3’ of \@cls@pkg\space #1,\MessageBreak
1003 <latexrelease>          but only version\MessageBreak
1004 <latexrelease>          ‘\csname ver@#1.\@current\endcsname’\MessageBreak
1005 <latexrelease>          is available}}}%
1006 <latexrelease>          \ifx\@current\@clsextension\let\LoadClass\@twoloadclasserror\fi
1007 <latexrelease>          \@popfilename
1008 <latexrelease>          \@reset@ptions}%
1009 <latexrelease>          \reserved@a}
1010 <latexrelease>
1011 <latexrelease>\let \load@onefile@withoptions \@undefined
1012 <latexrelease>\let \@missing@onefilewithoptions \@undefined
1013 <latexrelease>
1014 <latexrelease>\EndIncludeInRelease
1015 <*2ekernel>

```

*(End definition for \@fileswithoptions and others.)*

**\@@fileswith@pti@ns** Save the definition (for error checking).

```

1016 \let\@@fileswith@pti@ns\@fileswith@pti@ns
1017 \@onlypreamble\@@fileswith@pti@ns

```

*(End definition for \@@fileswith@pti@ns.)*

**\@reset@ptions** Reset the default option, and clear lists of declared options.

```

1018 \def\@reset@ptions{%
1019   \global\ifx\@current\@clsextension
1020     \let\default@ds\OptionNotUsed
1021   \else
1022     \let\default@ds\@unknownoptionerror
1023   \fi
1024   \global\let\ds@\@empty
1025   \global\let\@declaredoptions\@empty}
1026 \@onlypreamble\@reset@ptions

```

*(End definition for \@reset@ptions.)*

## 4.1 Hooks

Allow code to be saved to be executed at specific later times.

Save things in macros, I considered using toks registers, (and `\addto@hook` from the NFSS code, that would require stacking the contents in the case of required packages, so just generate a new macro for each package.

**\@begindocumenthook** Stuff to appear at the beginning or end of the document.

```

\@enddocumenthook
1027 \ifx\@begindocumenthook\@undefined
1028   \let\@begindocumenthook\@empty
1029 \fi
1030 \let\@enddocumenthook\@empty

```

*(End definition for \@begindocumenthook and \@enddocumenthook.)*

```

\AtEndOfPackage The access functions.
\AtEndOfClass
\AtBeginDocument 1031 \def\AtEndOfPackage{%
\AtEndDocument 1032 \expandafter\g@addto@macro\csname\@currname.\@current-h@@k\endcsname}
1033 \let\AtEndOfClass\AtEndOfPackage
1034 \@onlypreamble\AtEndOfPackage
1035 \@onlypreamble\AtEndOfClass
1036 \</2ekernel>
1037 \<*2ekernel | latexrelease>
1038 \<latexrelease>\IncludeInRelease{2020/10/01}%
1039 \<latexrelease> \<AtBeginDocument>\<Use hook system>%
1040 \DeclareRobustCommand\AtBeginDocument{\AddToHook{begindocument}}
1041 \DeclareRobustCommand\AtEndDocument {\AddToHook{enddocument}}
1042 %\DeclareRobustCommand\AtEndDocument {\AddToHook{env/document/end}} % alternative impl
1043 \</2ekernel | latexrelease>
1044 \<latexrelease>\EndIncludeInRelease
1045 \<latexrelease>\IncludeInRelease{0000/00/00}%
1046 \<latexrelease> \<AtBeginDocument>\<Use hook system>%
1047 \<latexrelease>
1048 \<latexrelease>\DeclareRobustCommand\AtBeginDocument{\g@addto@macro\@begindocumenthook}
1049 \<latexrelease>\DeclareRobustCommand\AtEndDocument{\g@addto@macro\@enddocumenthook}
1050 \<latexrelease>
1051 \<latexrelease>\EndIncludeInRelease
1052 \<*2ekernel>
1053 \@onlypreamble\AtBeginDocument
(End definition for \AtEndOfPackage and others.)

\@cls@pkg The current file type.
1054 \def\@cls@pkg{%
1055 \ifx\@current\@clsextension
1056 document class%
1057 \else
1058 package%
1059 \fi}
1060 \@onlypreamble\@cls@pkg
(End definition for \@cls@pkg.)

\@unknownoptionerror Bad option.
1061 \def\@unknownoptionerror{%
1062 \<@latex@error
1063 {Unknown option ‘\CurrentOption’ for \@cls@pkg\space‘\@currname’}%
1064 {The option ‘\CurrentOption’ was not declared in
1065 \@cls@pkg\space‘\@currname’, perhaps you\MessageBreak
1066 misspelled its name.
1067 Try typing \space <return>
1068 \space to proceed.}}
1069 \@onlypreamble\@unknownoptionerror
(End definition for \@unknownoptionerror.)

```

`\@@unprocessedoptions` Declare an error for each option, unless a `\ProcessOptions` occurred.

```

1070 \def\@@unprocessedoptions{%
1071   \ifx\@current\@pkgextension
1072     \edef\@curroptions{\@optionlist{\@currname.\@current}}%
1073     \@for\CurrentOption:=\@curroptions\do{%
1074       \ifx\CurrentOption\@empty\else\@unknownoptionerror\fi}%
1075   \fi}
1076 \onlypreamble\@unprocessedoptions
1077 \onlypreamble\@@unprocessedoptions

(End definition for \@@unprocessedoptions.)

```

`\@badrequireerror` `\RequirePackage` or `\LoadClass` occurs in the options section.

```

1078 \def\@badrequireerror#1[#2]#3[#4]{%
1079   \@latex@error
1080     {\noexpand\RequirePackage or \noexpand\LoadClass
1081      in Options Section}%
1082     {The \@cls@pkg\space '@@currname' is defective.\MessageBreak
1083      It attempts to load '#3' in the options section, i.e.,\MessageBreak
1084      between \noexpand\DeclareOption and \string\ProcessOptions.}}
1085 \onlypreamble\@badrequireerror

(End definition for \@badrequireerror.)

```

`\@twoloadclasserror` Two `\LoadClass` in a class.

```

1086 \def\@twoloadclasserror{%
1087   \@latex@error
1088     {Two \noexpand\LoadClass commands}%
1089     {You may only use one \noexpand\LoadClass in a class file}}
1090 \onlypreamble\@twoloadclasserror

(End definition for \@twoloadclasserror.)

```

`\@twoclasseserror` Two `\documentclass` or `\documentstyle`.

```

1091 \def\@twoclasseserror#1#2{%
1092   \@latex@error
1093     {Two \noexpand\documentclass or \noexpand\documentstyle commands}%
1094     {The document may only declare one class.}\@gobble}
1095 \onlypreamble\@twoclasseserror

(End definition for \@twoclasseserror.)

```

## 4.2 Providing shipment

`\two@digits` Prefix a number less than 10 with '0'.

```

1096 \def\two@digits#1{\ifnum#1<10 0\fi\number#1}

(End definition for \two@digits.)

```

`\filecontents*` This environment implements inline files. The star-form does not write extra comments into the file.

```

1097 </2ekernel>
1098 <*2ekernel | latexrelease>
1099 <latexrelease>\IncludeInRelease{2020/10/01}%
1100 <latexrelease>          {\filecontents*}{Define \@curr@file directly (gh/220)}%
1101 %

```

We use `@tempswa` to mean no preamble writing and reuse `@filesw` to indicate no overwriting:

```

1102 \def\filecontents{\@tempswatrue\@fileswtrue
1103   \ifnextchar[\filec@ntents@opt\filec@ntents
1104 }
1105 \@namedef{filecontents*}{\@tempswafalse\@fileswtrue
1106   \ifnextchar[\filec@ntents@opt\filec@ntents
1107 }
```

To handle the optional argument we execute for each option the command `\filec@ntents@OPTION` if it exist or complain about unknown option.

```

1108 \def\filec@ntents@opt[#1]{%
1109   \edef\@fortmp{\zap@space#1 \@empty}%
1110   \@for\reserved@a:=\@fortmp\do{%
1111     \ifcsname filec@ntents@\reserved@a\endcsname
1112       \csname filec@ntents@\reserved@a\endcsname
1113     \else
1114       \@latex@error{Unknown filecontents option \reserved@a}%
1115       {Valid options are force (or overwrite), nosearch, noheader}%
1116     \fi}%
1117   \filec@ntents
1118 }
```

Option `force` (or `overwrite`) changes the overwriting switch

```

1119 \let\filec@ntents@force\@fileswfalse
1120 \let\filec@ntents@overwrite\@fileswfalse % alternative name
```

and option `noheader` the preamble switch (which is equivalent to using the star form of the environment).

```

1121 \let\filec@ntents@noheader\@tempswafalse
```

Option `nosearch` only checks the current directory not the whole T<sub>E</sub>X tree for the existence of the file to write.

```

1122 \def\filec@ntents@nosearch{%
1123   \let\filec@ntents@checkdir\@currdir
1124   \def\filec@ntents@where{in current directory}}
```

By default we search the whole tree:

```

1125 \let\filec@ntents@checkdir\@empty
1126 \def\filec@ntents@where{exists on the system}

1127 \begingroup%
1128 \@tempcnta=1
1129 \loop
1130   \catcode\@tempcnta=12 %
1131   \advance\@tempcnta\@ne %
1132   \ifnum\@tempcnta<32 %
1133     \repeat %
1134   \catcode'\*=11 %
1135   \catcode'\^M\active%
1136   \catcode'\^L\active\let^L\relax%
1137   \catcode'\^I\active%

1138 \gdef\filec@ntents#1{%
1139   \set@curr@file{\filec@ntents@checkdir#1}%
1140   \edef\q@curr@file{"\@curr@file"}}
```

LuaTeX has more writes (and 18 is safe here).

```

1141 \chardef\reserved@c\ifx\directlua\@undefined 15 \else 127 \fi%
1142 \openin\@inputcheck\q@curr@file \space %
1143 \ifeof\@inputcheck%
1144   \@latex@note@no@line%
1145     {Writing file ‘\@currdir\@curr@file’}%
1146   \ch@ck7\reserved@c\write\relax%
1147   \immediate\openout\reserved@c\q@curr@file\relax%
1148 \else%
1149   \if@filesw%
1150     \@latex@note@no@line%
1151       {File ‘\@curr@file’ already \filec@ntents@where.\MessageBreak%
1152         Not generating it from this source}%
1153     \let\write\@gobbletwo%
1154     \let\closeout\@gobble%
1155   \else%

```

If we are overwriting, we try to make sure that the user is not by mistake overwriting the input file (`\jobname`). Of course, this only works for input files ending in `.tex`. If a different extension is used there is no way to see that we are overwriting ourselves!

```

1156   \edef\reserved@b{\detokenize\expandafter{\jobname}}%
1157   \ifx\@curr@file\reserved@b%
1158     \@fileswtrue%
1159   \else%
1160     \edef\reserved@b{\reserved@b\detokenize{.tex}}%
1161     \ifx\@curr@file\reserved@b
1162       \@fileswtrue%
1163     \fi%
1164   \fi%

```

We allocate a write channel but we open it only if it is (hopefully) safe. If not opened that means we are going to write on the terminal.

```

1165   \ch@ck7\reserved@c\write\relax%
1166   \if@filesw% % Foul ... trying to overwrite \jobname!
1167   \@latex@error{Trying to overwrite ‘\jobname.tex’}{You can’t %
1168     write to the file you are reading from!\MessageBreak%
1169     Data is written to screen instead.}%
1170   \else%
1171     \@latex@warning@no@line%
1172       {Writing or overwriting file ‘\@currdir\@curr@file’}%
1173     \immediate\openout\reserved@c\q@curr@file\relax%
1174   \fi%
1175 \fi%
1176 \fi%

```

Closing the `\@inputcheck` is done here to avoid having to do this in each branch.

```

1177 \closein\@inputcheck%
1178 \if@tempswa%
1179   \immediate\write\reserved@c{%
1180     \@percentchar\@percentchar\space%
1181     \expandafter\@gobble\string\LaTeX2e file ‘\@curr@file’^J%
1182     \@percentchar\@percentchar\space generated by the %

```

```

1183      '@\currentvir' \expandafter\@gobblefour\string\newenvironment^^J%
1184      \@percentchar\@percentchar\space from source '\jobname' on %
1185      \number\year/\two@digits\month/\two@digits\day.^^J%
1186      \@percentchar\@percentchar}%
1187 \fi%
1188 \let\do\@makeother\dospecials%

```

If there are active characters in the upper half (e.g., from `inputenc` there would be confusion so we render everything harmless.

```

1189 \count@ 128\relax%
1190 \loop%
1191   \catcode\count@ 11\relax%
1192   \advance\count@ \@ne%
1193   \ifnum\count@<\ccclvi%
1194 \repeat%

1195 \edef\E{\@backslashchar end\string{\@currentvir\string}}%
1196 \edef\reserved@b{%
1197   \def\noexpand\reserved@b%
1198     #####1\E####2\E####3\relax}%
1199 \reserved@b{%
1200   \ifx\relax##3\relax%

```

There was no `\end{filecontents}`

```

1201   \immediate\write\reserved@c{##1}%
1202 \else%

```

There was a `\end{filecontents}`, so stop this time.

```

1203   \edef^^M{\noexpand\end{\@currentvir}}%
1204   \ifx\relax##1\relax%
1205 \else%

```

Text before the `\end`, write it with a warning.

```

1206   \@latex@warning{Writing text '##1' before %
1207   \string\end{\@currentvir}\MessageBreak
1208   as last line of \@curr@file}%
1209   \immediate\write\reserved@c{##1}%
1210 \fi%
1211 \ifx\relax##2\relax%
1212 \else%

```

Text after the `\end`, ignore it with a warning.

```

1213   \@latex@warning{%
1214     Ignoring text '##2' after \string\end{\@currentvir}}%
1215 \fi%
1216 \fi%
1217 ^^M}%

1218 \catcode'\^^L\active%
1219 \let\L\@undefined%
1220 \def^^L{\expandafter\ifx\csname L\endcsname\relax\fi ^^J^^J}%
1221 \catcode'\^^I\active%
1222 \let\I\@undefined%
1223 \def^^I{\expandafter\ifx\csname I\endcsname\relax\fi\space}%
1224 \catcode'\^^M\active%
1225 \edef^^M##1^^M{%

```

```

1226 \noexpand\reserved@b##1\E\E\relax}}%
1227 \endgroup%

1228 </2ekernel | latexrelease>
1229 <latexrelease>\EndIncludeInRelease
1230 <latexrelease>\IncludeInRelease{2019/10/01}%
1231 <latexrelease> \{filec@ntents\}{Spaces in file names + optional arg}%
1232 <latexrelease>
1233 <latexrelease>\def\filecontents{\@tempswatrue\@fileswtrue
1234 <latexrelease> \ifnextchar[\filec@ntents@opt\filec@ntents
1235 <latexrelease>}
1236 <latexrelease>\@namedef{filecontents*}{\@tempswafalse\@fileswtrue
1237 <latexrelease> \ifnextchar[\filec@ntents@opt\filec@ntents
1238 <latexrelease>}
1239 <latexrelease>\def\filec@ntents@opt[#1]{%
1240 <latexrelease> \edef\@fortmp{\zap@space#1 \@empty}%
1241 <latexrelease> \@for\reserved@a:=\@fortmp\do{%
1242 <latexrelease> \ifcsname filec@ntents@\reserved@a\endcsname
1243 <latexrelease> \csname filec@ntents@\reserved@a\endcsname
1244 <latexrelease> \else
1245 <latexrelease> \@latex@error{Unknown filecontents option \reserved@a}%
1246 <latexrelease> {Valid options are force (or overwrite), nosearch, noheader}%
1247 <latexrelease> \fi}%
1248 <latexrelease> \filec@ntents
1249 <latexrelease>}
1250 <latexrelease>\let\filec@ntents@force\@fileswfalse
1251 <latexrelease>\let\filec@ntents@overwrite\@fileswfalse % alternative name
1252 <latexrelease>\let\filec@ntents@noheader\@tempswafalse
1253 <latexrelease>\def\filec@ntents@nosearch{%
1254 <latexrelease> \let\filec@ntents@checkdir\@currdir
1255 <latexrelease>\def\filec@ntents@where{in current directory}}
1256 <latexrelease>\let\filec@ntents@checkdir\@empty
1257 <latexrelease>\def\filec@ntents@where{exists on the system}
1258 <latexrelease>\begingroup%
1259 <latexrelease>\@tempcnta=1
1260 <latexrelease>\loop
1261 <latexrelease> \catcode\@tempcnta=12 %
1262 <latexrelease> \advance\@tempcnta\@one %
1263 <latexrelease>\ifnum\@tempcnta<32 %
1264 <latexrelease>\repeat %
1265 <latexrelease>\catcode'\*=11 %
1266 <latexrelease>\catcode'\^^M\active%
1267 <latexrelease>\catcode'\^^L\active\let^^L\relax%
1268 <latexrelease>\catcode'\^^I\active%
1269 <latexrelease>\gdef\filec@ntents#1{%
1270 <latexrelease> \set@curr@file{\filec@ntents@checkdir#1}%
1271 <latexrelease> \edef\q@curr@file{\expandafter\quote@name\expandafter{\@curr@file}}%
1272 <latexrelease> \chardef\reserved@c\ifx\directlua\undefined 15 \else 127 \fi%
1273 <latexrelease> \openin\@inputcheck\q@curr@file \space %
1274 <latexrelease> \ifeof\@inputcheck%
1275 <latexrelease> \@latex@warning@no@line%
1276 <latexrelease> {Writing file '\@currdir\@curr@file'}%
1277 <latexrelease> \ch@ck7\reserved@c\write\relax%
1278 <latexrelease> \immediate\openout\reserved@c\q@curr@file\relax%
1279 <latexrelease> \else%

```

```

1280 <latexrelease> \if@filesw%
1281 <latexrelease> \@latex@warning@no@line%
1282 <latexrelease> {File '@curr@file' already \filec@ntents@where.\MessageBreak%
1283 <latexrelease> Not generating it from this source}%
1284 <latexrelease> \let\write\@gobbletwo%
1285 <latexrelease> \let\closeout\@gobble%
1286 <latexrelease> \else%
1287 <latexrelease> \edef\reserved@a{#1}%
1288 <latexrelease> \edef\reserved@a{\detokenize\expandafter{\reserved@a}}%
1289 <latexrelease> \edef\reserved@b{\detokenize\expandafter{\jobname}}%
1290 <latexrelease> \ifx\reserved@a\reserved@b%
1291 <latexrelease> \@fileswtrue%
1292 <latexrelease> \else%
1293 <latexrelease> \edef\reserved@b{\reserved@b\detokenize{.tex}}%
1294 <latexrelease> \ifx\reserved@a\reserved@b
1295 <latexrelease> \@fileswtrue%
1296 <latexrelease> \fi%
1297 <latexrelease> \fi%
1298 <latexrelease> \ch@ck7\reserved@c\write\relax%
1299 <latexrelease> \if@filesw% % Foul ... trying to overwrite \jobname!
1300 <latexrelease> \@latex@error{Trying to overwrite '@jobname.tex'}{You can't %
1301 <latexrelease> write to the file you are reading from!\MessageBreak%
1302 <latexrelease> Data is written to screen instead.}%
1303 <latexrelease> \else%
1304 <latexrelease> \@latex@warning@no@line%
1305 <latexrelease> {Writing or overwriting file '@currdir\@curr@file'}%
1306 <latexrelease> \immediate\openout\reserved@c\curr@file\relax%
1307 <latexrelease> \fi%
1308 <latexrelease> \fi%
1309 <latexrelease> \fi%
1310 <latexrelease> \closein\@inputcheck%
1311 <latexrelease> \if@tempswa%
1312 <latexrelease> \immediate\write\reserved@c{%
1313 <latexrelease> \@percentchar\@percentchar\space%
1314 <latexrelease> \expandafter\@gobble\string\LaTeX2e file '@curr@file'^~J%
1315 <latexrelease> \@percentchar\@percentchar\space generated by the %
1316 <latexrelease> '@currenvir' \expandafter\@gobblefour\string\newenvironment^^J%
1317 <latexrelease> \@percentchar\@percentchar\space from source '\jobname' on %
1318 <latexrelease> \number\year/\two@digits\month/\two@digits\day.^~J%
1319 <latexrelease> \@percentchar\@percentchar}%
1320 <latexrelease> \fi%
1321 <latexrelease> \let\do\@makeother\dospecials%
1322 <latexrelease> \count@ 128\relax%
1323 <latexrelease> \loop%
1324 <latexrelease> \catcode\count@ 11\relax%
1325 <latexrelease> \advance\count@ \@ne%
1326 <latexrelease> \ifnum\count@<\@cclvi%
1327 <latexrelease> \repeat%
1328 <latexrelease> \edef\E{\@backslashchar end\string{\@currenvir\string}}%
1329 <latexrelease> \edef\reserved@b{%
1330 <latexrelease> \def\noexpand\reserved@b%
1331 <latexrelease> #####1\E####2\E####3\relax}%
1332 <latexrelease> \reserved@b{%
1333 <latexrelease> \ifx\relax##3\relax%

```



```

1334 <latexrelease> \immediate\write\reserved@c{##1}%
1335 <latexrelease> \else%
1336 <latexrelease> \edef^^M{\noexpand\end{\@currentvir}}%
1337 <latexrelease> \ifx\relax##1\relax%
1338 <latexrelease> \else%
1339 <latexrelease> \@latex@warning{Writing text ‘##1’ before %
1340 <latexrelease> \string\end{\@currentvir}\MessageBreak as last line of \@curr@file}%
1341 <latexrelease> \immediate\write\reserved@c{##1}%
1342 <latexrelease> \fi%
1343 <latexrelease> \ifx\relax##2\relax%
1344 <latexrelease> \else%
1345 <latexrelease> \@latex@warning{%
1346 <latexrelease> Ignoring text ‘##2’ after \string\end{\@currentvir}}%
1347 <latexrelease> \fi%
1348 <latexrelease> \fi%
1349 <latexrelease> ^^M}%
1350 <latexrelease> \catcode‘^^L\active%
1351 <latexrelease> \let\L\@undefined%
1352 <latexrelease> \def^^L{\expandafter\ifx\csname L\endcsname\relax\fi ^^J^^J}%
1353 <latexrelease> \catcode‘^^I\active%
1354 <latexrelease> \let\I\@undefined%
1355 <latexrelease> \def^^I{\expandafter\ifx\csname I\endcsname\relax\fi\space}%
1356 <latexrelease> \catcode‘^^M\active%
1357 <latexrelease> \edef^^M##1^^M{%
1358 <latexrelease> \noexpand\reserved@b##1\E\E\relax}}%
1359 <latexrelease> \endgroup%
1360 <latexrelease> \EndIncludeInRelease
1361 <latexrelease> \IncludeInRelease{0000/00/00}%
1362 <latexrelease> {\filec@ntents}{Spaces in file names + optional arg}%
1363 <latexrelease>
1364 <latexrelease> \let\filec@ntents@opt \@undefined
1365 <latexrelease> \let\filec@ntents@force \@undefined
1366 <latexrelease> \let\filec@ntents@overwrite \@undefined
1367 <latexrelease> \let\filec@ntents@noheader \@undefined
1368 <latexrelease> \let\filec@ntents@nosearch \@undefined
1369 <latexrelease> \let\filec@ntents@checkdir \@undefined
1370 <latexrelease> \let\filec@ntents@where \@undefined
1371 <latexrelease>
1372 <latexrelease> \begingroup%
1373 <latexrelease> \@tempcnta=1
1374 <latexrelease> \loop
1375 <latexrelease> \catcode\@tempcnta=12 %
1376 <latexrelease> \advance\@tempcnta\@ne %
1377 <latexrelease> \ifnum\@tempcnta<32 %
1378 <latexrelease> \repeat %
1379 <latexrelease> \catcode‘\*=11 %
1380 <latexrelease> \catcode‘^^M\active%
1381 <latexrelease> \catcode‘^^L\active\let^^L\relax%
1382 <latexrelease> \catcode‘^^I\active%
1383 <latexrelease>
1384 <latexrelease> \gdef\filec@ntents#1{%
1385 <latexrelease> \openin\@inputcheck#1 %
1386 <latexrelease> \ifeof\@inputcheck%
1387 <latexrelease> \@latex@warning@no@line%

```

```

1388 <latexrelease> {Writing file '@currdir#1'}%
1389 <latexrelease> \chardef\reserved@c15 %
1390 <latexrelease> \ch@ck7\reserved@c\write%
1391 <latexrelease> \immediate\openout\reserved@c#1\relax%
1392 <latexrelease> \else%
1393 <latexrelease> \closein\@inputcheck%
1394 <latexrelease> \@latex@warning@no@line%
1395 <latexrelease> {File '#1' already exists on the system.\MessageBreak%
1396 <latexrelease> Not generating it from this source}%
1397 <latexrelease> \let\write\@gobbletwo%
1398 <latexrelease> \let\closeout\@gobble%
1399 <latexrelease> \fi%
1400 <latexrelease> \if@tempswa%
1401 <latexrelease> \immediate\write\reserved@c{%
1402 <latexrelease> \@percentchar\@percentchar\space%
1403 <latexrelease> \expandafter\@gobble\string\LaTeX2e file '#1'^^J%
1404 <latexrelease> \@percentchar\@percentchar\space generated by the %
1405 <latexrelease> '@currentvir' \expandafter\@gobblefour\string\newenvironment^^J%
1406 <latexrelease> \@percentchar\@percentchar\space from source '\jobname' on %
1407 <latexrelease> \number\year/\two@digits\month/\two@digits\day.^^J%
1408 <latexrelease> \@percentchar\@percentchar}%
1409 <latexrelease> \fi%
1410 <latexrelease> \let\do\@makeother\dospecials%
1411 <latexrelease> \count@ 128\relax%
1412 <latexrelease> \loop%
1413 <latexrelease> \catcode\count@ 11\relax%
1414 <latexrelease> \advance\count@ \@ne%
1415 <latexrelease> \ifnum\count@<\ccclvi%
1416 <latexrelease> \repeat%
1417 <latexrelease> \edef\E{\@backslashchar end\string{\@currentvir\string}}%
1418 <latexrelease> \edef\reserved@b{%
1419 <latexrelease> \def\noexpand\reserved@b%
1420 <latexrelease> #####1\E####2\E####3\relax}%
1421 <latexrelease> \reserved@b{%
1422 <latexrelease> \ifx\relax##3\relax%
1423 <latexrelease> \immediate\write\reserved@c{##1}%
1424 <latexrelease> \else%
1425 <latexrelease> \edef^^M{\noexpand\end{\@currentvir}}%
1426 <latexrelease> \ifx\relax##1\relax%
1427 <latexrelease> \else%
1428 <latexrelease> \@latex@warning{Writing text '##1' before %
1429 <latexrelease> \string\end{\@currentvir}\MessageBreak as last line of #1}%
1430 <latexrelease> \immediate\write\reserved@c{##1}%
1431 <latexrelease> \fi%
1432 <latexrelease> \ifx\relax##2\relax%
1433 <latexrelease> \else%
1434 <latexrelease> \@latex@warning{%
1435 <latexrelease> Ignoring text '##2' after \string\end{\@currentvir}}%
1436 <latexrelease> \fi%
1437 <latexrelease> \fi%
1438 <latexrelease> ^^M}%
1439 <latexrelease>
1440 <latexrelease> \catcode'\^^L\active%
1441 <latexrelease> \let\L\@undefined%

```

```

1442 <latexrelease> \def^^L{\expandafter\ifx\cscname L\endcscname\relax\fi ^^J^^J}%
1443 <latexrelease> \catcode'\^^I\active%
1444 <latexrelease> \let\I\@undefined%
1445 <latexrelease> \def^^I{\expandafter\ifx\cscname I\endcscname\relax\fi\space}%
1446 <latexrelease> \catcode'\^^M\active%
1447 <latexrelease> \edef^^M##1^^M{%
1448 <latexrelease> \noexpand\reserved@b##1\E\E\relax}}%
1449 <latexrelease>\endgroup%
1450 <latexrelease>\EndIncludeInRelease
1451 <*2ekernel>

1452 \begingroup
1453 \catcode'\|= \catcode'\%
1454 \catcode'\%=12
1455 \catcode'\*=11
1456 \gdef\@percentchar{%}
1457 \gdef\endfilecontents{|
1458 \immediate\closeout\reserved@c
1459 \def\T##1##2##3{|
1460 \ifx##1\@undefined\else
1461 \@latex@warning@no@line{##2 has been converted to Blank ##3e}|
1462 \fi}|
1463 \T\L{Form Feed}{Lin}|
1464 \T\I{Tab}{Spac}|
1465 \immediate\write\@unused{}}
1466 \global\let\endfilecontents*\endfilecontents

```

We no longer prevent the code to be used after begin document (no rollback needed for this change).

```

1467 %\@onlypreamble\filecontents
1468 %\@onlypreamble\endfilecontents
1469 %\@onlypreamble\filecontents*
1470 %\@onlypreamble\endfilecontents*
1471 \endgroup
1472 %\@onlypreamble\filecontents
(End definition for \filecontents and \endfilecontents.)

```

## 5 Package/class rollback mechanism

```

1473 </2ekernel>
1474 <*2ekernel | latexreleasefirst>

```

`\pkgcls@debug` For testing we have a few extra lines of code that by default do nothing but one can set `\pkgcls@debug` to `\typeout` to get extra info. Sometime in the future this will be dropped.

```

1475 <*tracerollback>
1476 %\let\pkgcls@debug\typeout
1477 \let\pkgcls@debug\@gobble
1478 </tracerollback>

(End definition for \pkgcls@debug.)

```

`\requestedLaTeXdate` The macro (!) `\requestedLaTeXdate` holds the globally requested rollback date (via `latexrelease`) or zero if no such request was made.

```

1479 \def\requestedLaTeXdate{0}

```

(End definition for `\requestedLaTeXdate`.)

`\pkgcls@targetdate` If a rollback for a package or class is requested then `\pkgcls@targetdate` holds the requested date as a number YYYYMMDD (if there was one, otherwise the value of `\requestedLaTeXdate`) and `\pkgcls@targetlabel` will be empty. If there was a request for a named version then `\pkgcls@targetlabel` holds the version name and `\pkgcls@targetdate` is set to 1.

`\pkgcls@targetdate=0` is used to indicate that there was no rollback request. While loading an old release `\pkgcls@targetdate` is also reset to zero so that `\DeclareRelease` declarations are bypassed.

In contrast `\pkgcls@innerdate` will always hold the requested date (in a macro not a counter) if there was one, otherwise, e.g., if there was no request or a request to a version name it will contain T<sub>E</sub>X largest legal number. While loading a file this can be used to provide conditionals that select code based on the request.

```
1480 \ifx\pkgcls@targetdate\undefined
1481   \newcount\pkgcls@targetdate
1482 \fi
1483 \let\pkgcls@targetlabel\@empty
1484 \def\pkgcls@innerdate{\maxdimen}
```

(End definition for `\pkgcls@targetdate`, `\pkgcls@targetlabel`, and `\pkgcls@innerdate`.)

`\pkgcls@candidate` When looping through the `\DeclareRelease` declarations we record if the release is the best candidate we have seen so far. This is recorded in `\pkgcls@candidate` and we update it whenever we see a better one.

In `\pkgcls@releasedate` we keep track of the release date of that candidate.

```
1485 \let\pkgcls@candidate\@empty
1486 \let\pkgcls@releasedate\@empty
```

(End definition for `\pkgcls@candidate` and `\pkgcls@releasedate`.)

`\load@onefilewithoptions` the best place to add the rollback code is at the point where `\@onefilewithoptions` is called to load a single class or package.

To make things easy we save the old definition as `\load@onefilewithoptions` and then provide a new interface.

Important: as this code is also unconditionally placed into `latexrelease` we can only do this name change once otherwise both macros will contain the same code.

```
1487 \ifx\load@onefilewithoptions\undefined
1488   \let\load@onefilewithoptions\@onefilewithoptions
1489   \def\@onefilewithoptions#1[#2][#3]#4{%
```

First a bit of tracing normally disabled.

```
1490 \tracingrollback)
1491   \pkgcls@debug{--- File loaded request (\noexpand\usepackage or ...)}%
1492   \pkgcls@debug{\@spaces 1: #1}%
1493   \pkgcls@debug{\@spaces 2: #2}%
1494   \pkgcls@debug{\@spaces 3: #3}%
1495   \pkgcls@debug{\@spaces 4: #4}%
1496 \tracingrollback)
```

Two of the arguments are needed later on in error/warning messages so we save them.

```
1497   \def\pkgcls@name{#1}%           % for info message
1498   \def\pkgcls@arg {#3}%          % for info message
```

then we parse the final optional argument to determine if there is a specific rollback request for the current file. This will set `\pkgcls@targetdate`, `\pkgcls@targetlabel` and `\pkgcls@mindate`.

```
1499 \pkgcls@parse@date@arg{#3}%
```

When determining the correct release to load we keep track of candidates in `\pkgcls@candidate` and initially we don't have any:

```
1500 \let\pkgcls@candidate\@empty
```

If we had a rollback request then `#3` may contain data but not necessarily a “minimal date” so instead of passing it on we pass on the content of `\pkgcls@mindate`. We need to pass the value not the command, otherwise nested packages may pick up the wrong information.

```
1501 \begingroup
1502 \edef\reserved@a{%
1503   \endgroup
1504   \unexpanded{\load@onefilewithoptions#1[#2]}%
1505   [\pkgcls@mindate]%
1506   \unexpanded{#4}}%
1507 \reserved@a
1508 }
1509 \fi
```

(End definition for `\load@onefilewithoptions` and `\@onefilewithoptions`.)

`\pkgcls@parse@date@arg` The `\pkgcls@parse@date@arg` command parses the second optional argument of `\usepackage`, `\RequirePackage` or `\documentclass` for a rollback request setting the values of `\pkgcls@targetdate` and `\pkgcls@targetlabel`.

This optional argument has a dual purpose: If it just contains a date string then this means that the package should have at least that date (to ensure that a certain feature is actually available, or a certain bug has been fixed). When the package gets loaded the information in `\Provides...` will then be checked against this request.

But if it starts with an equal sign followed by a date string or followed by a version name then this means that we should roll back to the state of the package at that date or to the version with the requested name.

If there was no optional argument or the optional argument does not start with “=” then the `\pkgcls@targetdate` is set to the date of the overall rollback request (via `latexrelease`) or if that was not given it is set to 0. In either case `\pkgcls@targetlabel` will be made empty.

If the argument doesn't start with “=” then it is supposed to be a “minimal date” and we therefore save the value in `\pkgcls@mindate`, otherwise this macro is made empty.

So in summary we have:

Input	<code>\pkgcls@targetdate</code>	<code>\pkgcls@targetlabel</code>	<code>\pkgcls@mindate</code>
<code>&lt;empty&gt;</code>	<code>&lt;global-rollbackdate-as-number&gt;</code>	<code>&lt;empty&gt;</code>	<code>&lt;empty&gt;</code>
<code>&lt;date&gt;</code>	<code>&lt;global-rollbackdate-as-number&gt;</code>	<code>&lt;empty&gt;</code>	<code>&lt;date&gt;</code>
<code>=&lt;date&gt;</code>	<code>&lt;date-as-number&gt;</code>	<code>&lt;empty&gt;</code>	<code>&lt;empty&gt;</code>
<code>=&lt;version&gt;</code>	1	<code>&lt;version&gt;</code>	<code>&lt;empty&gt;</code>
<code>&lt;other&gt;</code>	<code>&lt;global-rollbackdate-as-number&gt;</code>	<code>&lt;empty&gt;</code>	<code>&lt;other&gt;</code>

where `<global-rollbackdate-as-number>` is a date request given via `latexrelease` or if there wasn't one 0.

```
1510 \def\pkgcls@parse@date@arg #1{%
```

If the argument is empty we use the rollback date from `latexrelease` which has the value of zero if there was no rollback request. The label and the minimal date is made empty in that case.

```

1511 \ifx\@nil#1\@nil
1512   \pkgcls@targetdate\requestedLaTeXdate\relax
1513   \let\pkgcls@targetlabel\@empty
1514   \let\pkgcls@mindate\@empty

```

Otherwise we parse the argument further, checking for a = as the first character. We append a = at the end so that there is at least one such character in the argument.

```

1515 \else
1516   \pkgcls@parse@date@arg@#1=\@nil\relax
1517 \fi
1518 }

```

The actual parsing work then happens in `\pkgcls@parse@date@arg@`:

```

1519 \def\pkgcls@parse@date@arg@#1=#2\@nil{%

```

We set `\pkgcls@targetdate` depending on the parsing result; the code is expandable so we can do the parsing as part of the assignment.

```

1520   \pkgcls@targetdate

```

If a = was in first position then #1 will be empty. In that case #2 will be the original argument with a = appended.

This can be parsed with `\@parse@version`, the trailing character is simply ignored. This macro returns the parsed date as a number (or zero if it wasn't a date) and accepts both YYYY/MM/DD and YYYY-MM-DD formats.

```

1521   \ifx\@nil#1\@nil
1522     \@parse@version0#2//00\@nil\relax

```

Whatever is returned is thus assigned to `\pkgcls@targetdate` and therefore we can now test its value. If the value is zero we assume that the remaining argument string represents a version and change `\pkgcls@targetdate` and set `\pkgcls@targetlabel` to the version name (after stripping off the trailing =).

```

1523   \ifnum \pkgcls@targetdate=\z@
1524     \pkgcls@targetdate\@ne
1525     \def\pkgcls@innerdate{\maxdimen}%
1526     \pkgcls@parse@date@arg@version#2%
1527   \else
1528     \edef\pkgcls@innerdate{\the\pkgcls@targetdate}%
1529   \fi
1530   \let\pkgcls@mindate\@empty
1531 \else

```

If #1 was not empty then there wasn't a = character in first position so we are dealing either with a "minimum date" or with some incorrect data. We assume the former and make the following assignments (the first one finishing the assignment of `\pkgcls@targetdate`):

```

1532   \requestedLaTeXdate\relax
1533   \let\pkgcls@targetlabel\@empty
1534   \def\pkgcls@innerdate{\maxdimen}%
1535   \def\pkgcls@mindate{#1}%

```

If the min-date is after the requested rollback date (if there is any, i.e., if it is not zero) then we have a conflict and therefore issue a warning.

```

1536     \ifnum \pkgcls@targetdate > \z@
1537     \ifnum \@parse@version0#1//00\@nil > \pkgcls@targetdate
1538     \@latex@warning@no@line{Suspicious rollback/min-date date given\MessageBreak
1539     A minimal date of #1 has been specified for
1540     \cls@pkg\MessageBreak '\pkgcls@name'.\MessageBreak
1541     But this is in conflict
1542     with a rollback request to \requestedpatchdate}
1543     \fi
1544     \fi
1545     \fi
1546 }

```

Strip off the trailing = and assign the version name to \pkgcls@targetlabel.

```

1547 \def\pkgcls@parse@date@arg@version#1={%
1548   \def\pkgcls@targetlabel{#1}}

```

(End definition for \pkgcls@parse@date@arg.)

**\DeclareRelease** First argument is the “name” of the release and it can be left empty if one doesn’t like to give a name to the release. The second argument is that from which on this release was available (or should be used in case of minor updates). The final argument is the external file name of this release, by convention this should be  $\langle pkg/cls-name \rangle - \langle date \rangle . \langle extension \rangle$  but this is not enforced and through this argument one can overwrite it.

```

1549 \def\DeclareRelease#1#2#3{%
1550   \ifnum\pkgcls@targetdate>\z@ % some sort of rollback request
1551   \tracerrollback
1552     \pkgcls@debug{---\string\DeclareRelease:}%
1553     \pkgcls@debug{\@spaces 1: #1}%
1554     \pkgcls@debug{\@spaces 2: #2}%
1555     \pkgcls@debug{\@spaces 3: #3}%
1556   \tracerrollback

```

If the date argument #2 is empty we are dealing with a special release that should be only accessible via its name; a typical use case would be a “beta” release. So if we are currently processing a date request we ignore it and otherwise we check if we can match the name and if so load the corresponding release file.

```

1557     \ifx\@nil#2\@nil
1558     \ifnum\pkgcls@targetdate=\@ne % named request
1559       \def\reserved@a{#1}%
1560       \ifx\pkgcls@targetlabel\reserved@a
1561         \pkgcls@use@this@release{#3}{}%
1562       \tracerrollback
1563     \else
1564       \pkgcls@debug{Label doesn't match}%
1565     \tracerrollback
1566     \fi
1567   \tracerrollback
1568   \else
1569     \pkgcls@debug{Date request: ignored}%
1570   \tracerrollback
1571   \fi
1572   \else

```

If the value of `\pkgcls@targetdate` is greater than 1 (or in reality greater than something like 19930101) we are dealing with a rollback request to a specific date.

```
1573 \ifnum\pkgcls@targetdate>\@ne % a real request
```

So we parse the date of this release to check if it is before or after the request date.

```
1574 \ifnum\@parse@version#2//00\@nil
1575 >\pkgcls@targetdate
```

If it is after we have to distinguish between two cases: If there was an earlier candidate we use that one because the other is too late, but if there wasn't one (i.e., if current release is the oldest that exists) we use it as the best choice. However in that case something is wrong (as there shouldn't be a rollback to a date where a package used doesn't yet exists. So we make a complained to the user.

```
1576 \ifx\pkgcls@candidate\@empty
1577 \pkgcls@rollbackdate@error{#2}%
1578 \pkgcls@use@this@release{#3}{#2}%
1579 \else
1580 \pkgcls@use@this@release\pkgcls@candidate
1581 \pkgcls@releasedate
1582 \fi
1583 \else
```

Otherwise, if the release date of this version is before the target rollback and we record it as a candidate. But we don't use it yet as there may be another release which is still before the target rollback.

```
1584 \def\pkgcls@candidate{#3}%
1585 \def\pkgcls@releasedate{#2}%
1586 (*tracerollback)
1587 \pkgcls@debug{New candidate: #3}%
1588 (/tracerollback)
1589 \fi
1590 \else
```

If we end up in this branch we have a named version request. So we check if `\pkgcls@targetlabel` matches the current name and if yes we use this release immediately, otherwise we do nothing as a later declaration may match it.

```
1591 \def\reserved@a{#1}%
1592 \ifx\pkgcls@targetlabel\reserved@a
1593 \pkgcls@use@this@release{#3}{#2}%
1594 (*tracerollback)
1595 \else
1596 \pkgcls@debug{Label doesn't match}%
1597 (/tracerollback)
1598 \fi
1599 \fi
1600 \fi
1601 \fi
1602 }
```

(End definition for `\DeclareRelease`.)

`\pkgcls@use@this@release` If a certain release has been selected (stored in the external file given in #1) we need to input it and afterwards stop reading the current file.

```
1603 \def\pkgcls@use@this@release#1#2{%
```



Before that we record the selection made inside the transcript.

```
1604 \pkgcls@show@selection{#1}{#2}%
```

We then set the `\pkgcls@targetdate` to zero so that any `\DeclareRelease` or `\DeclareCurrentRelease` in the file we now load are bypassed<sup>39</sup> and then we finally load the correct release.

After loading that file we need to stop reading the current file so we issue `\endinput`. Note that the `\relax` before that is essential to ensure that the `\endinput` is only happening after the file has been fully processed, otherwise it would act after the first line of the `@@input`!

```
1605 \pkgcls@targetdate\z@
1606 @@input #1\relax
1607 \endinput
1608 }
```

(End definition for `\pkgcls@use@this@release`.)

`\pkgcls@show@selection` This command records what selection was made. As that is needed in two places (and it is rather lengthy) it was placed in a separate command. The first argument is the name of the external file that is being loaded and is only needed for debugging. The second argument is the date that corresponds to this file and it is used as part of the message.

```
1609 \def\pkgcls@show@selection#1#2{%
1610 <*tracerollback>
1611 \pkgcls@debug{Result: use #1}%
1612 </tracerollback>
1613 \GenericInfo
1614 {\@spaces\@spaces\space}{Rollback for
1615 \@cls@pkg\space'\@currname' requested ->
1616 \ifnum\pkgcls@targetdate>\@ne
1617 date
1618 \ifnum\requestedLaTeXdate=\pkgcls@targetdate
1619 \requestedpatchdate
1620 \else
1621 \expandafter\@gobble\pkgcls@arg
1622 \fi.\MessageBreak
```

Instead of “best approximation” we could say that we have been able to exactly match the date (if it is exact), but that would mean extra tests without much gain, so not done.

```
1623 Best approximation is
1624 \else
1625 version '\pkgcls@targetlabel'.\MessageBreak
1626 This corresponds to
1627 \fi
1628 \ifx\@nil#2\@nil
1629 a special release%
1630 \else
1631 the release introduced on #2%
1632 \fi
1633 \@gobble}%
1634 }
```

---

<sup>39</sup>The older release may also have such declarations inside if it was a simply copy of the `.sty` or `.cls` file current at that date. Removing these declarations would make the file load a tiny bit faster, but this way it works in any case.

(End definition for `\pkgcls@show@selection`.)

`\pkgcls@rollbackdate@error` This is called if the requested rollback date is earlier than the earliest known release of a package or class.

A similar error is given if global rollback date and min-date on a specific package conflict with each other, but that case is happens only once so it is inlined.

```
1635 \def\pkgcls@rollbackdate@error#1{%
1636   \@latex@error{Suspicious rollback date given}%
1637   {The \@cls@pkg\space'\@currname' has no rollback data
1638     before #1 which\MessageBreak
1639     is after your requested rollback date --- so
1640     something may be wrong here.\MessageBreak
1641     Continue and we use the earliest known release.}}
```

(End definition for `\pkgcls@rollbackdate@error`.)

`\DeclareCurrentRelease` This declares the date (and possible name) of the current version of a package or class.

```
1642 \def\DeclareCurrentRelease#1#2{%
```

First we test if `\pkgcls@targetdate` is greater than zero, otherwise this code is bypassed (as there is no rollback request).

```
1643   \ifnum\pkgcls@targetdate>\z@ % some sort of rollback request
1644   {*tracerollback}
1645     \pkgcls@debug{---DeclareCurrentRelease}%
1646     \pkgcls@debug{ 1: #1}%
1647     \pkgcls@debug{ 2: #2}%
1648   }/tracerollback)
```

If the value is greater than 1 we have to deal with a date request, so we parse #2 as a date and compare it with `\pkgcls@targetdate`.

```
1649     \ifnum\pkgcls@targetdate>\@ne % a date request
1650     \ifnum\@parse@version#2//00\@nil
1651       >\pkgcls@targetdate
```

If it is greater that means the release date if this file is later than the requested rollback date. Again we have two cases: If there was a previous candidate release we use that one as the current release is too young, but if there wasn't we have to use this release nevertheless as there isn't any alternative.

However this case can only happen if there is a `\DeclareCurrentRelease` but no declared older releases (so basically the use of the declaration is a bit dubious).

```
1652       \ifx\pkgcls@candidate\@empty
1653       \pkgcls@rollbackdate@error{#2}%
1654     \else
1655       \pkgcls@use@this@release\pkgcls@candidate
1656       \pkgcls@releasedate
1657     \fi
```

Otherwise the current file is the right release, so we record that in the transcript and then carry on.

```
1658     \else
1659     \pkgcls@show@selection{current version}{#2}%
1660     \fi
1661   \else % a label request
```

Otherwise we have a rollback request to a named version so we check if that fits the current name and if not give an error as this was the last possible opportunity.

```

1662     \def\reserved@a{#1}%
1663     \ifx\pkgcls@targetlabel\reserved@a
1664         \pkgcls@show@selection{current version}{#2}%
1665     \else
1666         \@latex@error{Requested version '\pkgcls@targetlabel' for
1667             \cls@pkg\space'\currname' is unknown}\@ehc
1668     \fi
1669 \fi
1670 \fi
1671 }

```

(End definition for `\DeclareCurrentRelease`.)

**\IfTargetDateBefore** This enables a simple form of conditional code inside a class or package file. If there is a date request and the request date is earlier than the first argument the code in the second argument is processed otherwise the code in the third argument is processed. If there was no date request then we also execute the third argument, i.e., we will get the “latest” version of the file.

Most often the second argument (before-date-code) will be empty.

```

1672 \DeclareRobustCommand\IfTargetDateBefore[1]{%
1673     \ifnum\pkgcls@innerdate <%
1674         \expandafter\@parse@version\expandafter0#1//00\@nil
1675         \typeout{Exclude code introduced on #1}%
1676         \expandafter\@firstoftwo
1677     \else
1678         \typeout{Include code introduced on #1}%
1679         \expandafter\@secondoftwo
1680     \fi
1681 }

```

(End definition for `\IfTargetDateBefore`.)

```

1682 </2ekernel | latexreleasefirst>

```

## 6 After Preamble

Finally we declare a package that allows all the commands declared above to be `\@onlypreamble` to be used after `\begin{document}`.

```

1683 <*afterpreamble>
1684 \NeedsTeXFormat{LaTeX2e}
1685 \ProvidesPackage{pkgindoc}
1686     [2020-08-08 v1.3m Package Interface in Document (DPC)]
1687 \def\reserved@a#1\do\@classoptionslist#2\do\filecontents#3\relax{%
1688     \gdef\@preamblecmds{#1#3}}
1689 \expandafter\reserved@a\@preamblecmds\relax
1690 </afterpreamble>

```

## File V

# ltkeys.dtx

## 1 Creating and using keyval options

As with any key–value input, using key–value pairs as package or class options has two parts: creating the key options and setting (using) them. Options created in this way *may* be used after package loading as general key–value settings: this will depend on the nature of the underlying code.

---

**\DeclareKeys** \DeclareKeys [*<family>*] {*<declarations>*}

Creates a series of options from a comma-separated *<declarations>* list. Each entry in this list is a key–value pair, with the *<key>* having one or more *<properties>*. A small number of “basic” *<properties>* are described below. The full range of properties, provided by `l3keys`, can also be used for more powerful processing. See `interface3` for the full details.

The basic properties provided here are

- `.code` — execute arbitrary code
- `.if` — sets a `\if...` switch
- `.store` — stores a value in a macro
- `.usage` — defines whether the option can be given only when loading (`load`), in the preamble (`preamble`) or has no limitation on scope (`general`)

The part of the *<key>* before the *<property>* is the *<name>*, with the *<value>* working with the *<property>* to define the behaviour of the option.

For example, with

```
\DeclareKeys[mypkg]
{
  draft.if           = @mypkg@draft      ,
  draft.usage        = preamble          ,
  name.store         = \@mypkg@name      ,
  name.usage         = load              ,
  second-name.store = \@mypkg@other@name
}
```

three options would be create. The option `draft` can be given anywhere in the preamble, and will set a switch called `\if@mypkg@draft`. The option `name` can only be given during package loading, and will save whatever value it is given in `\@mypkg@name`. Finally, the option `second-name` can be given anywhere, and will save its value in `\@mypkg@other@name`.

Keys created *before* the use of `\ProcessKeyOptions` act as package options.

---

**\DeclareUnknownKeyHandler** \DeclareUnknownKeyHandler [*<family>*] {*<code>*}

The function `\DeclareUnknownKeyHandler` may be used to define the behavior when an undefined key is encountered. The *<code>* will receive the unknown key name as `#1` and the value as `#2`. These can then be processed as appropriate, e.g. by forwarding to another package.

---

**\ProcessKeyOptions** \ProcessKeyOptions [*<family>*]

---

The `\ProcessKeyOptions` function is used to check the current option list against the keys defined for *<family>*. Global (class) options and local (package) options are checked when this function is called in a package.

---

**\SetKeys** \SetKeys [*<family>*] {*<keyvals>*}

---

Sets (applies) the explicit list of *<keyvals>* for the *<family>*: if the latter is not given, the value of `\@currname` is used. This command may be used within a package to set options before or after using `\ProcessKeyOptions`.

## 1.1 Implementation of `ltkeys`

```

1 <@@=keys>
2 <*2ekernel>
3 \ExplSyntaxOn

```

## 1.2 Key properties

```

.code
  .if 4 \group_begin:
.store 5 \cs_set_protected:Npn \__keys_tmp:nn #1#2
.usage 6 {
7     \quark_if_recursion_tail_stop:n {#1}
8     \cs_new_eq:cc
9       { \c__keys_props_root_str . #2 }
10      { \c__keys_props_root_str . #1 }
11     \__keys_tmp:nn
12  }
13  \__keys_tmp:nn
14    { code:n } { code }
15    { legacy_if_set:n } { if }
16    { tl_set:N } { store }
17    { usage:n } { usage }
18    { \q_recursion_tail } { }
19    \q_recursion_stop
20  \group_end:

```

(End definition for `.code` and others.)

## 1.3 Main mechanism

```

21 \cs_generate_variant:Nn \clist_put_right:Nn { Nv }

```

`\l__keys_options_clist` A single list is used for all options, into which they are collected before processing.

```

22 \clist_new:N \l__keys_options_clist

```

(End definition for `\l__keys_options_clist`.)

---

**\l\_\_keys\_options\_loading\_bool**

---

Used to indicate we are in the loading phase: controls the outcome of warnings.

```

23 \bool_new:N \l__keys_options_loading_bool

```

`\__keys_options:n` The main function calls functions to collect up the global and local options into `\l__keys_options_clist` before calling the underlying functions to actually do the processing. So that a suitable message is produced if the option is unknown, the special `unknown` key is set if it does not already exist for the current family, and is cleaned up afterwards if required. To allow the L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> layer to know this mechanism is active, and to deal with the key family not matching the file name, we store the family in all cases.

```

24 \cs_new_protected:Npn \__keys_options:n #1
25   { \__keys_options_expand_module:Nn \__keys_options_aux:n {#1} }
26 \cs_new_protected:Npn \__keys_options_aux:n #1
27   {
28     \cs_gset_nopar:cpn { opt@fam@\currname.\@currrent } {#1}
29     \cs_set_protected:Npn \__keys_option_end: { }
30     \clist_clear:N \l__keys_options_clist
31     \__keys_options_global:n {#1}
32     \__keys_options_local:
33     \keys_if_exist:nnF {#1} { unknown }
34     {
35       \keys_define:nn {#1}
36       {
37         unknown .code:n =
38         {
39           \msg_error:nnxx { keys } { option-unknown }
40           { \l_keys_key_str } { \@currrent }
41         }
42       }
43       \cs_set_protected:Npn \__keys_option_end:
44       { \keys_define:nn {#1} { unknown .undefine: } }
45     }
46     \bool_set_true:N \l__keys_options_loading_bool
47     \keys_set:nV {#1} \l__keys_options_clist
48     \bool_set_false:N \l__keys_options_loading_bool
49     \AtEndOfPackage { \cs_set_eq:NN \@unprocessedoptions \scan_stop: }
50     \__keys_option_end:
51     \__keys_options_loaded:n {#1}
52   }
53 \msg_new:nnnn { keys } { option-unknown }
54 { Unknown-option-~'~#1'~for~package~#2. }
55 {
56   LaTeX-has-been-asked-to-set-an-option-called-~'~#1'~
57   but-the-~#2~package-has-not-created-an-option-with-this-name.
58 }

```

(End definition for `\__keys_options:n`, `\__keys_options_aux:n`, and `\__keys_options_end:`.)

`\__keys_options_global:n` Global (class) options are handled differently for L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> packages and classes. Hence this function is essentially a check on the current file type. The initial test is needed as L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> allows variables to be equal to `\scan_stop:`, which is usually forbidden in expl3 code.

```

59 \cs_new_protected:Npn \__keys_options_global:n #1
60   {
61     \cs_if_eq:NNF \@raw@classoptionslist \scan_stop:
62     {
63       \cs_if_eq:NNTF \@currrent \@clsextension

```

```

64         { \_keys_options_class:n {#1} }
65         { \_keys_options_package:n {#1} }
66     }
67 }

```

(End definition for \\_keys\_options\_global:n.)

\\_keys\_options\_class:n  
\\_keys\_options\_class:nnn

For classes, each option (stripped of any content after =) is checked for existence as a key. If found, the option is added to the combined list for processing. On the other hand, unused options are stored up in \@unusedoptionlist. Before any of that, though, there is a simple check to see if there is an unknown key. If there is, then *everything* will match and the mapping can be skipped.

```

68 \cs_new_protected:Npn \_keys_options_class:n #1
69 {
70     \cs_if_free:cF { @raw@opt@ \@currname . \@currentx }
71     {
72         \keys_if_exist:nnTF {#1} { unknown }
73         {
74             \clist_put_right:Nv \l__keys_options_clist
75             { @raw@opt@ \@currname . \@currentx }
76         }
77         {
78             \clist_map_inline:cn { @raw@opt@ \@currname . \@currentx }
79             {
80                 \exp_args:Ne \_keys_options_class:nnn
81                 { \_keys_remove_equals:n {##1} }
82                 {##1} {#1}
83             }
84         }
85     }
86 }
87 \cs_new_protected:Npn \_keys_options_class:nnn #1#2#3
88 {
89     \keys_if_exist:nnTF {#3} {#1}
90     { \clist_put_right:Nn \l__keys_options_clist {#2} }
91     {
92         \str_if_eq:eeF
93         { \exp_not:v { @raw@opt@ \@currname . \@currentx } }
94         { \exp_not:V \@raw@classoption }
95         { \clist_put_right:Nn \@unusedoptionlist {#1} }
96     }
97 }

```

(End definition for \\_keys\_options\_class:n and \\_keys\_options\_class:nnn.)

\\_keys\_options\_package:n  
\\_keys\_options\_package:nnn

For global options when processing a package, the tasks are slightly different from those for a class. The check is the same, but here there is nothing to do if the option is not applicable. Each valid option also needs to be removed from \@unusedoptionlist.

```

98 \cs_new_protected:Npn \_keys_options_package:n #1
99 {
100     \clist_map_inline:Nn \@raw@classoptionslist
101     {
102         \exp_args:Ne \_keys_options_package:nnn
103         { \_keys_remove_equals:n {##1} }

```

```

104         {##1} {#1}
105     }
106 }
107 \cs_new_protected:Npn \__keys_options_package:nnn #1#2#3
108 {
109     \keys_if_exist:nnT {#3} {#1}
110     {
111         \clist_put_right:Nn \l__keys_options_clist {#2}
112         \clist_remove_all:Nn \@unusedoptionlist {#1}
113     }
114 }

```

(End definition for `\__keys_options_package:n` and `\__keys_options_package:nnn`.)

`\__keys_options_local:` If local options are found, they are added to the processing list. L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> stores options for each file in a macro which may or may not exist, hence the need to use `\cs_if_exist:c`.

```

115 \cs_new_protected:Npn \__keys_options_local:
116 {
117     \cs_if_eq:NNF \@currentt \@clsextension
118     {
119         \cs_if_exist:cT { @raw@opt@ \@currname . \@currentt }
120         {
121             \clist_put_right:Nv \l__keys_options_clist
122             { @raw@opt@ \@currname . \@currentt }
123         }
124     }
125 }

```

(End definition for `\__keys_options_local:.`)

`\__keys_remove_equals:n` As the name suggests, this is a simple function to remove an equals sign from the input.  
`\__keys_remove_equals:w` This is all wrapped up in an `n` function so that there will always be a sign available.

```

126 \cs_new:Npn \__keys_remove_equals:n #1
127 { \__keys_remove_equals:w #1 = \s__keys_stop }
128 \cs_new:Npn \__keys_remove_equals:w #1 = #2 \s__keys_stop { \exp_not:n {#1} }

```

(End definition for `\__keys_remove_equals:n` and `\__keys_remove_equals:w`.)

## 1.4 The document interfaces

```

129 \cs_generate_variant:Nn \keys_define:nn { nx }

```

`\__keys_options_expand_module:Nn` To deal with active characters inside the module argument whilst also expanding that argument, we use a combination of `c`- and `f`-type expansion. This works as the definitions for active UTF-8 bytes contain an `\ifincsname` test.  
`\__keys_options_expand_module:nN`

```

130 \cs_new_protected:Npn \__keys_options_expand_module:Nn #1#2
131 {
132     \cs:w __keys_options_expand_module:nN \use:e { \cs_end: {#2} } #1
133 }
134 \cs_new_protected:Npn \__keys_options_expand_module:nN #1#2
135 { #2 {#1} }

```

(End definition for `\__keys_options_expand_module:Nn` and `\__keys_options_expand_module:nN`.)



**\DeclareKeys** Defining key options is quite straight-forward: we have an intermediate function to allow for potential set-up steps.

```
136 \NewDocumentCommand \DeclareKeys { 0 { \@currname } +m }
137 { \_keys_options_expand_module:Nn \keys_define:nn {#1} {#2} }
```

(End definition for \DeclareKeys. This function is documented on page 868.)

#### **\DeclareUnknownKeyHandler**

```
138 \NewDocumentCommand \DeclareUnknownKeyHandler { 0 { \@currname } +m }
139 {
140   \cs_set_protected:cpn { \_keys_unknown_handler_ #1 :nn } ##1##2 {#2}
141   \_keys_options_expand_module:Nn \keys_define:nx {#1}
142   {
143     unknown .code:n =
144       \exp_not:N \exp_args:NV
145       \exp_not:c { \_keys_unknown_handler_ #1 :nn }
146       \exp_not:N \l_keys_key_str {###1}
147   }
148 }
```

(End definition for \DeclareUnknownKeyHandler. This function is documented on page 868.)

**\ProcessKeyOptions** We need to deal with the older interface from l3keys2e here: it had a mandatory argument. We can mop that up using a look-ahead, and then exploit that information to determine whether the package option handling is set up for the new approach for clash handling.

```
149 \NewDocumentCommand \ProcessKeyOptions { 0 { \@currname } }
150 { \_keys_options:n {#1} }
151 \@onlypreamble \ProcessKeyOptions
```

(End definition for \ProcessKeyOptions. This function is documented on page 869.)

## 1.5 Option usage scope

**\\_keys\_options\_loaded:n** Indicates that the load-time options for a package have been processed: once this has happened, make them unavailable either with a warning or an error.

**\\_keys\_options\_loaded:nn**

```
152 \cs_new_protected:Npn \_keys_options_loaded:n #1
153 {
154   \prop_get:NnNT \l_keys_usage_load_prop {#1} \l_keys_tmpa_tl
155   {
156     \clist_map_inline:Nn \l_keys_tmpa_tl
157     {
158       \keys_define:nn {#1}
159       {
160         ##1 .code:n =
161         \_keys_options_loaded:nn {#1} {##1}
162       }
163     }
164   }
165 }
166 \cs_new_protected:Npn \_keys_options_loaded:nn #1#2
167 {
168   \bool_if:NTF \l_keys_options_loading_bool
169   {
170     \msg_warning:nxxx { keys } { load-option-ignored }
```

```

171         { \use:c { opt@fam@\currname.\@currentext } } {#2}
172     }
173     { \msg_error:nnnn { keys } { load-only } {#1} {#2} }
174 }
175 \msg_new:nnn { keys } { load-option-ignored }
176 { Package~"#1"~has~already~been~loaded:~ignoring~load~time~option~"#2". }
177 \msg_new:nnnn { keys } { load-only }
178 { Key~"#2"~may~only~be~used~in~the~during~loading~of~package~"#1". }
179 {
180     LaTeX~was~asked~to~set~a~key~called~"#2",~but~this~is~only~allowed~
181     in~the~optional~argument~when~loading~package~"#1".
182 }

```

(End definition for `\_keys_options_loaded:n` and `\_keys_options_loaded:nn`.)

Disable all preamble options in one shot.

```

183 \tl_gput_left:Nn \@kernel@after@begindocument
184 {
185     \prop_map_inline:Nn \l_keys_usage_preamble_prop
186     {
187         \clist_map_inline:nn {#2}
188         {
189             \keys_define:nn {#1}
190             {
191                 ##1 .code:n =
192                 \msg_error:nnn { keys } { preamble-only } {##1}
193             }
194         }
195     }
196 }
197 \msg_new:nnnn { keys } { preamble-only }
198 { Key~"#1"~may~only~be~used~in~the~preamble. }
199 {
200     LaTeX~was~asked~to~set~a~key~called~"#1",~but~this~is~only~allowed~
201     before~\begin{document}.~You~will~need~to~set~the~key~earlier.
202 }

```

## 1.6 General key setting

**\SetKeys** A simple wrapper.

```

203 \NewDocumentCommand \SetKeys { 0 { \@currname } +m }
204 { \_keys_options_expand_module:Nn \keys_set:nn {#1} {#2} }

```

(End definition for `\SetKeys`. This function is documented on page [869](#).)

```

205 \ExplSyntaxOff
206 \</2ekernel>

```

# File W

## ltfilehook.dtx

### 1 Introduction

#### 1.1 Provided hooks

The code offers a number of hooks into which packages (or the user) can add code to support different use cases. Many hooks are offered as pairs (i.e., the second hook is reversed). Also important to know is that these pairs are properly nested with respect to other pairs of hooks.

There are hooks that are executed for all files of a certain type (if they contain code), e.g., for all “include files” or all “packages”, and there are also hooks that are specific to a single file, e.g., do something after the package `foo.sty` has been loaded.

#### 1.2 General hooks for file reading

There are four hooks that are called for each file that is read using document-level commands such as `\input`, `\include`, `\usepackage`, etc. They are not called for files read using internal low-level methods, such as `\@input` or `\openin`.

<code>file/before</code>	These are:
<code>file/.../before</code>	
<code>file/.../after</code>	
<code>file/after</code>	

**`file/before`, `file/⟨file-name⟩/before`** These hooks are executed in that order just before the file is loaded for reading. The code of the first hook is used with every file, while the second is executed only for the file with matching `⟨file-name⟩` allowing you to specify code that only applies to one file.

**`file/⟨file-name⟩/after`, `file/after`** These hooks are after the file with name `⟨file-name⟩` has been fully consumed. The order is swapped (the specific one comes first) so that the `/before` and `/after` hooks nest properly, which is important if any of them involve grouping (e.g., contain environments, for example). Furthermore both hooks are reversed hooks to support correct nesting of different packages adding code to both `/before` and `/after` hooks.

So the overall sequence of hook processing for any file read through the user interface commands of L<sup>A</sup>T<sub>E</sub>X is:

```
\UseHook{⟨file/before⟩}
\UseHook{⟨file/⟨file name⟩/before⟩}
  ⟨file contents⟩
\UseHook{⟨file/⟨file name⟩/after⟩}
\UseHook{⟨file/after⟩}
```

The file hooks only refer to the file by its name and extension, so the `⟨file name⟩` should be the file name as it is on the filesystem with extension (if any) and without paths. Different from `\input` and similar commands, the `.tex` extension is not assumed in hook `⟨file name⟩`, so `.tex` files must be specified with their extension to be recognized. Files within subfolders should also be addressed by their name and extension only.

Extensionless files also work, and should then be given without extension. Note however that T<sub>E</sub>X prioritizes .tex files, so if two files `foo` and `foo.tex` exist in the search path, only the latter will be seen.

When a file is input, the `<file name>` is available in `\CurrentFile`, which is then used when accessing the `file/<file name>/before` and `file/<file name>/after`.

---

<code>\CurrentFile</code>	The name of the file about to be read (or just finished) is available to the hooks through <code>\CurrentFile</code> (there is no expl3 name for it for now). The file is always provided with its extension, i.e., how it appears on your hard drive, but without any specified path to it. For example, <code>\input{sample}</code> and <code>\input{app/sample.tex}</code> would both have <code>\CurrentFile</code> being <code>sample.tex</code> .
---------------------------	---

---

<code>\CurrentFilePath</code>	The path to the current file (complement to <code>\CurrentFile</code> ) is available in <code>\CurrentFilePath</code> if needed. The paths returned in <code>\CurrentFilePath</code> are only user paths, given through <code>\input@path</code> (or expl3's equivalent <code>\l_file_search_path_seq</code> ) or by directly typing in the path in the <code>\input</code> command or equivalent. Files located by <code>kpsewhich</code> get the path added internally by the T <sub>E</sub> X implementation, so at the macro level it looks as if the file were in the current folder, so the path in <code>\CurrentFilePath</code> is empty in these cases (package and class files, mostly).
-------------------------------	--

---

<code>\CurrentFileUsed</code> <code>\CurrentFilePathUsed</code>	In normal circumstances these are identical to <code>\CurrentFile</code> and <code>\CurrentFilePath</code> . They will differ when a file substitution has occurred for <code>\CurrentFile</code> . In that case, <code>\CurrentFileUsed</code> and <code>\CurrentFilePathUsed</code> will hold the actual file name and path loaded by L <sup>A</sup> T <sub>E</sub> X, while <code>\CurrentFile</code> and <code>\CurrentFilePath</code> will hold the names that were <i>asked for</i> . Unless doing very specific work on the file being read, <code>\CurrentFile</code> and <code>\CurrentFilePath</code> should be enough.
--	---

### 1.3 Hooks for package and class files

Commands to load package and class files (e.g., `\usepackage`, `\RequirePackage`, `\LoadPackageWithOptions`, etc.) offer the hooks from section 1.2 when they are used to load a package or class file, e.g., `file/array.sty/after` would be called after the `array` package got loaded. But as packages and classes form as special group of files, there are some additional hooks available that only apply when a package or class is loaded.

---

<code>package/before</code>	These are:
<code>package/after</code>	
<code>package/.../before</code>	<b><code>package/before</code>, <code>package/after</code></b> These hooks are called for each package being loaded.
<code>package/.../after</code>	
<code>class/before</code>	<b><code>package/&lt;name&gt;/before</code>, <code>package/&lt;name&gt;/after</code></b> These hooks are additionally called if
<code>class/after</code>	the package name is <code>&lt;name&gt;</code> (without extension).
<code>class/.../before</code>	<b><code>class/before</code>, <code>class/after</code></b> These hooks are called for each class being loaded.
<code>class/.../after</code>	
	<b><code>class/&lt;name&gt;/before</code>, <code>class/&lt;name&gt;/after</code></b> These hooks are additionally called if the
	class name is <code>&lt;name&gt;</code> (without extension).

All `/after` hooks are implemented as reversed hooks.  
The overall sequence of execution for `\usepackage` and friends is therefore:

```

\UseHook{<package/before>}
\UseHook{<package/<package name>/before>}

  \UseHook{<file/before>}
  \UseHook{<file/<package name>.sty/before>}
  <package contents>
  \UseHook{<file/<package name>.sty/after>}
  \UseHook{<file/after>}

  code from \AtEndOfPackage if used inside the package

\UseHook{<package/<package name>/after>}
\UseHook{<package/after>}

```

and similar for class file loading, except that `package/` is replaced by `class/` and `\AtEndOfPackage` by `\AtEndOfClass`.

If a package or class is not loaded (or it was loaded before the hooks were set) none of the hooks are executed!

All class or package hooks involving the name of the class or package are implemented as one-time hooks, whereas all other such hooks are normal hooks. This allows for the following use case

```

\AddToHook{package/varioref/after}
{ ... apply my customizations if the package gets
  loaded (or was loaded already) ... }

```

without the need to first test if the package is already loaded.

## 1.4 Hooks for `\include` files

To manage `\include` files,  $\text{\LaTeX}$  issues a `\clearpage` before and after loading such a file. Depending on the use case one may want to execute code before or after these `\clearpages` especially for the one that is issued at the end.

Executing code before the final `\clearpage`, means that the code is processed while the last page of the included material is still under construction. Executing code after it means that all floats from inside the include file are placed (which might have added further pages) and the final page has finished.

Because of these different scenarios we offer hooks in three places.<sup>40</sup> None of the hooks are executed when an `\include` file is bypassed because of an `\includeonly` declaration. They are, however, all executed if  $\text{\LaTeX}$  makes an attempt to load the `\include` file (even if it doesn't exist and all that happens is “No file `<filename>.tex`”).

---

<sup>40</sup>If you want to execute code before the first `\clearpage` there is no need to use a hook—you can write it directly in front of the `\include`.

<code>include/before</code>	These are:
<code>include/.../before</code>	
<code>include/end</code>	<b><code>include/before, include/&lt;name&gt;/before</code></b> These hooks are executed (in that order) after the initial <code>\clearpage</code> and after <code>.aux</code> file is changed to use <code>&lt;name&gt;.aux</code> , but
<code>include/.../end</code>	before the <code>&lt;name&gt;.tex</code> file is loaded. In other words they are executed at the very
<code>include/after</code>	beginning of the first page of the <code>\include</code> file.
<code>include/.../after</code>	

**`include/<name>/end, include/end`** These hooks are executed (in that order) after `LATEX` has stopped reading from the `\include` file, but before it has issued a `\clearpage` to output any deferred floats.

**`include/<name>/after, include/after`** These hooks are executed (in that order) after `LATEX` has issued the `\clearpage` but before it has switched back writing to the main `.aux` file. Thus technically we are still inside the `\include` and if the hooks generate any further typeset material including anything that writes to the `.aux` file, then it would be considered part of the included material and bypassed if it is not loaded because of some `\includeonly` statement.<sup>41</sup>

**`include/excluded, include/<name>/excluded`** The above hooks for `\include` files are only executed when the file is loaded (or more exactly the load is attempted). If, however, the `\include` file is explicitly excluded (through an `\includeonly` statement) the above hooks are bypassed and instead the `include/excluded` hook followed by the `include/<name>/excluded` hook are executed. This happens after `LATEX` has loaded the `.aux` file for this include file, i.e., after `LATEX` has updated its counters to pretend that the file was seen.

All `include` hooks involving the name of the included file are implemented as one-time hooks (whereas all other such hooks are normal hooks).

If you want to execute code that is run for every `\include` regardless of whether or not it is excluded, use the `cmd/include/before` or `cmd/include/after` hooks.

## 1.5 High-level interfaces for `LATEX`

We do not provide any additional wrappers around the hooks (like `filehook` or `scrfile` do) because we believe that for package writers the high-level commands from the hook management, e.g., `\AddToHook`, etc. are sufficient and in fact easier to work with, given that the hooks have consistent naming conventions.

<sup>41</sup>For that reason another `\clearpage` is executed after these hooks which normally does nothing, but starts a new page if further material got added this way.

## 1.6 Internal interfaces for L<sup>A</sup>T<sub>E</sub>X

---

<code>\declare@file@substitution</code>	<code>\declare@file@substitution</code>	<code>{\file}} {\replacement-file}}</code>
<code>\undeclare@file@substitution</code>	<code>\undeclare@file@substitution</code>	<code>{\file}}</code>

---

If `\file` is requested for loading replace it with `\replacement-file`. `\CurrentFile` remains pointing to `\file` but `\CurrentFileUsed` will show the file actually loaded.

The main use case for this declaration is to provide a corrected version of a package that can't be changed (due to its license) but no longer functions because of L<sup>A</sup>T<sub>E</sub>X kernel changes, for example, or to provide a version that makes use of new kernel functionality while the original package remains available for use with older releases.

The `\undeclare@file@substitution` declaration undoes a substitution made earlier.

*Please do not misuse this functionality and replace a file with another unless if really needed and only if the new version is implementing the same functionality as the original one!*

---

<code>\disable@package@load</code>	<code>\disable@package@load</code>	<code>{\package}} {\alternate-code}}</code>
<code>\reenable@package@load</code>	<code>\reenable@package@load</code>	<code>{\package}}</code>

---

If `\package` is requested do not load it but instead run `\alternate-code` which could issue a warning, error or any other code.

The main use case is for classes that want to restrict the set of supported packages or contain code that make the use of some packages impossible. So rather than waiting until the document breaks they can set up informative messages why certain packages are not available.

The function is only implemented for packages not for arbitrary files.

## 1.7 A sample package for structuring the log output

As an application we provide the package `structuredlog` that adds lines to the `.log` when a file is opened and closed for reading keeping track of nesting level as well. For example, for the current document it adds the lines

```
= (LEVEL 1 START) t1lmr.fd
= (LEVEL 1 STOP) t1lmr.fd
= (LEVEL 1 START) supp-pdf.mkii
= (LEVEL 1 STOP) supp-pdf.mkii
= (LEVEL 1 START) nameref.sty
== (LEVEL 2 START) refcount.sty
== (LEVEL 2 STOP) refcount.sty
== (LEVEL 2 START) gettitlestring.sty
== (LEVEL 2 STOP) gettitlestring.sty
= (LEVEL 1 STOP) nameref.sty
= (LEVEL 1 START) ltfilehook-doc.out
= (LEVEL 1 STOP) ltfilehook-doc.out
= (LEVEL 1 START) ltfilehook-doc.out
= (LEVEL 1 STOP) ltfilehook-doc.out
= (LEVEL 1 START) ltfilehook-doc.hd
```

```

= (LEVEL 1 STOP) ltfilehook-doc.hd
= (LEVEL 1 START) ltfilehook.dtx
== (LEVEL 2 START) ot1lmr.fd
== (LEVEL 2 STOP) ot1lmr.fd
== (LEVEL 2 START) om1lmm.fd
== (LEVEL 2 STOP) om1lmm.fd
== (LEVEL 2 START) omslmsy.fd
== (LEVEL 2 STOP) omslmsy.fd
== (LEVEL 2 START) omxlmex.fd
== (LEVEL 2 STOP) omxlmex.fd
== (LEVEL 2 START) umsa.fd
== (LEVEL 2 STOP) umsa.fd
== (LEVEL 2 START) umsb.fd
== (LEVEL 2 STOP) umsb.fd
== (LEVEL 2 START) ts1lmr.fd
== (LEVEL 2 STOP) ts1lmr.fd
== (LEVEL 2 START) t1lmss.fd
== (LEVEL 2 STOP) t1lmss.fd
= (LEVEL 1 STOP) ltfilehook.dtx

```

Thus if you inspect an issue in the .log it is easy to figure out in which file it occurred, simply by searching back for LEVEL and if it is a STOP then remove 1 from the level value and search further for LEVEL with that value which should then be the START level of the file you are in.

## 2 The Implementation

```

1 < *2ekernel >
2 < @@=filehook >

```

### 2.1 Document and package-level commands

**\CurrentFile** User-level macros that hold the current file name and file path. These are used internally as well because the code takes care to protect against a possible redefinition of these macros in the loaded file (it's necessary anyway to make hooks work with nested \input).

**\CurrentFilePath** The versions \...Used hold the *actual* file name and path that is loaded by L<sup>A</sup>T<sub>E</sub>X, whereas the other two hold the name as requested. They will differ in case there's a file substitution.

**\CurrentFileUsed**

**\CurrentFilePathUsed**

```

3 < /2ekernel >
4 < *2ekernel | latexrelease >
5 < latexrelease > \IncludeInRelease{2020/10/01}%
6 < latexrelease > { \CurrentFile } { Hook management file } %
7 \ExplSyntaxOn
8 \tl_new:N \CurrentFile
9 \tl_new:N \CurrentFilePath
10 \tl_new:N \CurrentFileUsed
11 \tl_new:N \CurrentFilePathUsed
12 \ExplSyntaxOff
13 < /2ekernel | latexrelease >
14 < latexrelease > \EndIncludeInRelease

```



```

15 <latexrelease>\IncludeInRelease{0000/00/00}%
16 <latexrelease>          {\CurrentFile}{Hook management file}%
17 <latexrelease>
18 <latexrelease>\let \CurrentFile          \@undefined
19 <latexrelease>\let \CurrentFilePath       \@undefined
20 <latexrelease>\let \CurrentFileUsed      \@undefined
21 <latexrelease>\let \CurrentFilePathUsed  \@undefined
22 <latexrelease>
23 <latexrelease>\EndIncludeInRelease
24 <*2ekernel>

```

(End definition for `\CurrentFile` and others. These functions are documented on page 876.)

## 2.2 expl3 helpers

```

25 </2ekernel>
26 <*2ekernel | latexrelease>
27 <latexrelease>\IncludeInRelease{2020/10/01}%
28 <latexrelease>          {\__filehook_file_parse_full_name:nN}{File helpers}%
29 \ExplSyntaxOn

```

`\__filehook_file_parse_full_name:nN`  
`\__filehook_full_name:nn`

A utility macro to trigger expl3's file-parsing and lookup, and return a normalized representation of the file name. If the queried file doesn't exist, no normalization takes place. The output of `\__filehook_file_parse_full_name:nN` is passed on to the #2—a 3-argument macro that takes the *<path>*, *<base>*, and *<ext>* parts of the file name.

```

30 \cs_new:Npn \__filehook_file_parse_full_name:nN #1
31 {
32   \exp_args:Nf \file_parse_full_name_apply:nN
33   {
34     \exp_args:Nf \__filehook_full_name:nn
35     { \file_full_name:n {#1} } {#1}
36   }
37 }
38 \cs_new:Npn \__filehook_full_name:nn #1 #2
39 {
40   \tl_if_empty:nTF {#1}
41   { \tl_trim_spaces:n {#2} }
42   { \tl_trim_spaces:n {#1} }
43 }

```

(End definition for `\__filehook_file_parse_full_name:nN` and `\__filehook_full_name:nn`.)

`\__filehook_if_no_extension:nTF`  
`\__filehook_drop_extension:N`

Some actions depend on whether the file extension was explicitly given, and sometimes the extension has to be removed. The macros below use `\__filehook_file_parse_full_name:nN` to split up the file name and either check if *<ext>* (#3) is empty, or discard it.

```

44 \cs_new:Npn \__filehook_if_no_extension:nTF #1
45 {
46   \exp_args:Ne \tl_if_empty:nTF
47   { \file_parse_full_name_apply:nN {#1} \use_iii:nnn }
48 }
49 \cs_new_protected:Npn \__filehook_drop_extension:N #1
50 {
51   \tl_gset:Nx #1

```

```

52     {
53       \exp_args:NV \__filehook_file_parse_full_name:nN #1
54       \__filehook_drop_extension_aux:nnn
55     }
56   }
57   \cs_new:Npn \__filehook_drop_extension_aux:nnn #1 #2 #3
58     { \tl_if_empty:nF {#1} { #1 / } #2 }

```

(End definition for \\_\_filehook\_if\_no\_extension:nTF and \\_\_filehook\_drop\_extension:N.)

\g\_\_filehook\_input\_file\_seq Yet another stack, to keep track of \CurrentFile and \CurrentFilePath with nested \l\_\_filehook\_internal\_tl \inputs. At the beginning of \InputIfFileExists, the current value of \CurrentFilePath and \CurrentFile is pushed to \g\_\_filehook\_input\_file\_seq, and at the end, it is popped and the value reassigned. Some other places don't use \InputIfFileExists directly (\include) or need \CurrentFile earlier (\@onefilewithoptions), so these are manually used elsewhere as well.

```

59   \tl_new:N \l__filehook_internal_tl
60   \seq_if_exist:NF \g__filehook_input_file_seq
61   { \seq_new:N \g__filehook_input_file_seq }
62   \cs_new_protected:Npn \__filehook_file_push:
63   {
64     \seq_gpush:Nx \g__filehook_input_file_seq
65     {
66       { \CurrentFilePathUsed } { \CurrentFileUsed }
67       { \CurrentFilePath      } { \CurrentFile      }
68     }
69   }
70   \cs_new_protected:Npn \__filehook_file_pop:
71   {
72     \seq_gpop:NNTF \g__filehook_input_file_seq \l__filehook_internal_tl
73     { \exp_after:wN \__filehook_file_pop_assign:nnnn \l__filehook_internal_tl }
74     {
75       \msg_error:nnn { latex2e } { should-not-happen }
76       { Tried~to~pop~from~an~empty~file~name~stack. }
77     }
78   }
79   \cs_new_protected:Npn \__filehook_file_pop_assign:nnnn #1 #2 #3 #4
80   {
81     \tl_set:Nn \CurrentFilePathUsed {#1}
82     \tl_set:Nn \CurrentFileUsed     {#2}
83     \tl_set:Nn \CurrentFilePath     {#3}
84     \tl_set:Nn \CurrentFile         {#4}
85   }
86   \ExplSyntaxOff

```

(End definition for \g\_\_filehook\_input\_file\_seq and others.)

```

87   </2ekernel | latexrelease>
88   <latexrelease>\EndIncludeInRelease

```

When rolling forward the following expl3 functions may not be defined. If we roll back the code does nothing.

```

89   <latexrelease>\IncludeInRelease{2020/10/01}%
90   <latexrelease>          {file_parse_full_name_apply:nN}{Roll forward help}%
91   <latexrelease>

```

```

92 <latexrelease>\ExplSyntaxOn
93 <latexrelease>\cs_if_exist:NF\file_parse_full_name_apply:nN
94 <latexrelease>{
95 <latexrelease>\cs_new:Npn \file_parse_full_name_apply:nN #1
96 <latexrelease> {
97 <latexrelease>   \exp_args:Ne \__file_parse_full_name_auxi:nN
98 <latexrelease>     { \__kernel_file_name_sanitiz:n {#1} }
99 <latexrelease> }
100 <latexrelease>\cs_new:Npn \__file_parse_full_name_auxi:nN #1
101 <latexrelease> {
102 <latexrelease>   \__file_parse_full_name_area:nw { } #1
103 <latexrelease>   / \s__file_stop
104 <latexrelease> }
105 <latexrelease>\cs_new:Npn \__file_parse_full_name_area:nw #1 #2 / #3 \s__file_stop
106 <latexrelease> {
107 <latexrelease>   \tl_if_empty:nTF {#3}
108 <latexrelease>     { \__file_parse_full_name_base:nw { } #2 . \s__file_stop {#1} }
109 <latexrelease>     { \__file_parse_full_name_area:nw { #1 / #2 }
110 <latexrelease>                                     #3 \s__file_stop }
111 <latexrelease> }
112 <latexrelease>\cs_new:Npn \__file_parse_full_name_base:nw #1 #2 . #3 \s__file_stop
113 <latexrelease> {
114 <latexrelease>   \tl_if_empty:nTF {#3}
115 <latexrelease>     {
116 <latexrelease>       \tl_if_empty:nTF {#1}
117 <latexrelease>         {
118 <latexrelease>           \tl_if_empty:nTF {#2}
119 <latexrelease>             { \__file_parse_full_name_tidy:nnnN { } { } }
120 <latexrelease>             { \__file_parse_full_name_tidy:nnnN { .#2 } { } }
121 <latexrelease>           }
122 <latexrelease>           { \__file_parse_full_name_tidy:nnnN {#1} { .#2 } }
123 <latexrelease>         }
124 <latexrelease>       { \__file_parse_full_name_base:nw { #1 . #2 }
125 <latexrelease>                                     #3 \s__file_stop }
126 <latexrelease>     }
127 <latexrelease>\cs_new:Npn \__file_parse_full_name_tidy:nnnN #1 #2 #3 #4
128 <latexrelease> {
129 <latexrelease>   \exp_args:Nee #4
130 <latexrelease>   {
131 <latexrelease>     \str_if_eq:nnF {#3} { / } { \use_none:n }
132 <latexrelease>     #3 \prg_do_nothing:
133 <latexrelease>   }
134 <latexrelease>   { \use_none:n #1 \prg_do_nothing: }
135 <latexrelease>   {#2}
136 <latexrelease> }
137 <latexrelease>}
138 <latexrelease>\ExplSyntaxOff
139 <latexrelease>
140 <latexrelease>\EndIncludeInRelease
141 <*2kernel>
142 <@@=>

```

## 2.3 Declaring the file-related hooks

These hooks have names with three-parts that start with `file/`, `include/`, `class/` or `package/` and end with `/before` or `/after` (or `/end` in the case of `include/`). They are all generic hooks so will be declared only if code is added to them; this declaration is done for you automatically and, indeed, they should not be declared explicitly.

Those named `.../after` and `include/.../end` are, when code is added, declared as reversed hooks.

## 2.4 Patching L<sup>A</sup>T<sub>E</sub>X’s `\InputIfFileExists` command

Most of what we have to do is adding `\UseHook` into several L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> core commands, because of some circular dependencies in the kernel we do this only now and not in `ltxfiles`.

`\InputIfFileExists` `\InputIfFileExists` loads any file if it is available so we have to add the hooks `file/before` and `file/after` in the right places. If the file doesn’t exist no hooks should be executed.

```

143 </2ekernel>
144 <latexrelease>\IncludeInRelease{2020/10/01}%
145 <latexrelease>          {\InputIfFileExists}{Hook management (files)}%
146 <*2ekernel | latexrelease>

147 \let\InputIfFileExists\@undefined
148 \DeclareRobustCommand \InputIfFileExists[2]{%
149   \IfFileExists{#1}%
150   {%
151     \@expl@@@filehook@file@push@@
152     \@filehook@set@CurrentFile

```

We pre-expand `\@filef@und` so that in case another file is loaded in the true branch of `\InputIfFileExists`, these don’t change their value meanwhile. This isn’t a worry with `\CurrentFile...` because they are kept in a stack.

```

153   \expandafter\@swaptwoargs\expandafter
154   {\expandafter\@input@file@exists@with@hooks
155     \expandafter{\@filef@und}}%
156   {#2}%
157   \@expl@@@filehook@file@pop@@
158 }%
159 }
160 \def\@input@file@exists@with@hooks#1{%

```

If the file exists then `\CurrentFile` holds its name. But we can’t rely on that still being true after the file has been processed. Thus for using the name in the file hooks we need to preserve the name and then restore it for the `file/.../after` hook.

The hook always refers to the file requested by the user. The hook is *always* loaded for `\CurrentFile` which usually is the same as `\CurrentFileUsed`. In the case of a file replacement, the `\CurrentFileUsed` holds the actual file loaded. In any case the file names are normalized so that the hooks work on the real file name, rather than what the user typed in.

`expl3`’s `\file_full_name:n` normalizes the file name (to factor out differences in the `.tex` extension), and then does a file lookup to take into account a possible path from `\l_file_search_path_seq` and `\input@path`. However only the file name and extension

are returned so that file hooks can refer to the file by their name only. The path to the file is returned in `\CurrentFilePath`.

```

161 \edef\reserved@a{%
162   \@expl@@@filehook@file@pop@assign@@nnnn
163   {\CurrentFilePathUsed}%
164   {\CurrentFileUsed}%
165   {\CurrentFilePath}%
166   {\CurrentFile}}%
167 \expandafter\@swaptwoargs\expandafter{\reserved@a}%

```

Before adding to the file list we need to make all (letter) characters catcode 11, because several packages use constructions like

```

\filename@parse{<filename>}
\ifx\filename@ext\@clsextension
...
\fi

```

and that doesn't work if `\filename@ext` is `\detokenized`. Making `\@clsextension` a string doesn't help much because some packages define their own `\<prefix>@someextension` with normal catcodes. This is not entirely correct because packages loaded (somehow) with catcode 12 alphabetic tokens (say, as the result of a `\string` or `\detokenize` command, or from a T<sub>E</sub>X string like `\jobname`) will have these character tokens incorrectly turned into letter tokens. This however is rare, so we'll go for the all-letters approach (grepping the packages in T<sub>E</sub>X Live didn't bring up any obvious candidate for breaking with this catcode change).

```

168 {\edef\reserved@a{\unqu@tefilef@und#1\@nil}%
169  \@addtofilelist{\string@makeletter\reserved@a}%
170  \UseHook{file/before}%

```

The current file name is available in `\CurrentFile` so we use that in the specific hook.

```

171  \UseHook{file/\CurrentFile/before}%
172  \@input #1% <- trailing space comes from \@filef@und
173  }%

```

And here, `\CurrentFile` is restored (by `\@expl@@@filehook@file@pop@assign@@nnnn`) so we can use it once more.

```

174  \UseHook{file/\CurrentFile/after}%
175  \UseHook{file/after}}
176 \def\unqu@tefilef@und"#1" \@nil{#1}

```

Now declare the non-generic file hooks used above:

```

177 \NewHook{file/before}
178 \NewReversedHook{file/after}
179 \<latexrelease>\EndIncludeInRelease
180 \</2kernel | latexrelease>

```

Now define `\InputIfFileExists` to input #1 if it seems to exist. Immediately prior to the input, #2 is executed. If the file #1 does not exist, execute '#3'.

```

181 \<latexrelease>\IncludeInRelease{2019/10/01}%
182 \<latexrelease>      {\InputIfFileExists}{Hook management (files)}%
183 \<latexrelease>
184 \<latexrelease>\DeclareRobustCommand \InputIfFileExists[2]{%
185 \<latexrelease>  \IfFileExists{#1}%
186 \<latexrelease>    {%

```

```

187 <latexrelease> \expandafter\@swaptwoargs\expandafter
188 <latexrelease> {\@filef@und}{#2\@addtofilelist{#1}\@input}}
189 <latexrelease>\let\@input@file@exists@with@hooks\@undefined
190 <latexrelease>\let\unqu@tefilef@und\@undefined
191 <latexrelease>\EndIncludeInRelease

192 <latexrelease>\IncludeInRelease{0000/00/00}%
193 <latexrelease> {\InputIfFileExists}{Hook management (files)}%
194 <latexrelease>\long\def \InputIfFileExists#1#2{%
195 <latexrelease> \IfFileExists{#1}%
196 <latexrelease> {#2\@addtofilelist{#1}\@input \@filef@und}}

```

Also undo the internal command as some packages unfortunately test for their existence instead of using `\IfFormatAtLeastTF`.

```

197 <latexrelease>\expandafter\let\csname InputIfFileExists \endcsname\@undefined
198 <latexrelease>\let\@input@file@exists@with@hooks\@undefined
199 <latexrelease>\let\unqu@tefilef@und\@undefined
200 <latexrelease>\EndIncludeInRelease
201 <*2ekernel>

```

(End definition for `\InputIfFileExists`, `\@input@file@exists@with@hooks`, and `\unqu@tefilef@und`.)

## 2.5 Declaring a file substitution

```

202 <@@=filehook>
203 </2ekernel>
204 <*2ekernel | latexrelease>
205 <latexrelease>\IncludeInRelease{2020/10/01}%
206 <latexrelease> {\_filehook_subst_add:nn}{Declaring file substitution}%
207 \ExplSyntaxOn

```

`\_filehook_subst_add:nn` declares a file substitution by doing a (global) definition of the form `\def\@file-subst@<file>{<replacement>}`. The file names are properly sanitised, and normalized with the same treatment done for the file hooks. That is, a file replacement is declared by using the file name (and extension, if any) only, and the file path should not be given. If a file name is empty it is replaced by `.tex` (the empty csname is used to check that).

```

208 \cs_new_protected:Npn \_filehook_subst_add:nn #1 #2
209 {
210   \group_begin:
211     \cs_set:cpx { } { \exp_not:o { \cs:w\cs_end: } }
212     \int_set:Nn \tex_escapechar:D { -1 }
213     \cs_gset:cpx
214     {
215       @file-subst@
216       \_filehook_subst_file_normalize:Nn \use_ii_iii:nnn {#1}
217     }
218     { \_filehook_subst_file_normalize:Nn \_filehook_file_name_compose:nnn
219       {#2} }
220   \group_end:
221 }
222 \cs_new_protected:Npn \_filehook_subst_remove:n #1
223 {
224   \group_begin:

```

```

225 \cs_set:cpx { } { \exp_not:o { \cs:w\cs_end: } }
226 \int_set:Nn \tex_escapechar:D { -1 }
227 \cs_undefine:c
228 {
229     @file-subst@
230     \__filehook_subst_file_normalize:Nn \use_ii_iii:nnn {#1}
231 }
232 \group_end:
233 }
234 \cs_new:Npn \__filehook_subst_file_normalize:Nn #1 #2
235 {
236     \exp_after:wN \__filehook_subst_empty_name_chk:NN
237     \cs:w \exp_after:wN \cs_end:
238     \cs:w \__filehook_file_parse_full_name:nN {#2} #1 \cs_end:
239 }
240 \cs_new:Npn \__filehook_subst_empty_name_chk:NN #1 #2
241 { \if_meaning:w #1 #2 .tex \else: \token_to_str:N #2 \fi: }

```

(End definition for `\__filehook_subst_add:nn` and others.)

`\use_ii_iii:nnn` A variant of `\use...` to discard the first of three arguments.

*Todo: this should move to `expl3`*

```

242 \cs_gset:Npn \use_ii_iii:nnn #1 #2 #3 {#2 #3}

```

(End definition for `\use_ii_iii:nnn`.)

```

243 \ExplSyntaxOff
244 </2ekernel | latexrelease>
245 <latexrelease>\EndIncludeInRelease
246 <*2ekernel>

```

`\declare@file@substitution` For two internals we provide L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> names so that we can use them elsewhere in the kernel (and so that they can be used in packages if really needed, e.g., `scrfile`).

`\undeclare@file@substitution`

```

247 </2ekernel>
248 <*2ekernel | latexrelease>
249 <latexrelease>\IncludeInRelease{2020/10/01}%
250 <latexrelease>          {\declare@file@substitution}{File substitution}%
251 \ExplSyntaxOn
252 \cs_new_eq:NN \declare@file@substitution \__filehook_subst_add:nn
253 \cs_new_eq:NN \undeclare@file@substitution \__filehook_subst_remove:n
254 \ExplSyntaxOff
255 </2ekernel | latexrelease>
256 <latexrelease>\EndIncludeInRelease

```

We are not fully rolling back the file substitutions in case a rollback encounters a package that contains them, but is itself not setup for rollback. So we just bypass them and hope for the best.

```

257 <latexrelease>\IncludeInRelease{0000/00/00}%
258 <latexrelease>          {\declare@file@substitution}{File substitution}%
259 <latexrelease>
260 <latexrelease>\let \declare@file@substitution \@gobbletwo
261 <latexrelease>\let \undeclare@file@substitution \@gobble
262 <latexrelease>
263 <latexrelease>\EndIncludeInRelease
264 <*2ekernel>

```

(End definition for `\declare@file@substitution` and `\undeclare@file@substitution`. These functions are documented on page 879.)

```
265 <@@=>
266 \ExplSyntaxOff
```

## 2.6 Selecting a file (`\set@curr@file`)

`\set@curr@file` Now we hook into `\set@curr@file` to resolve a possible file substitution, and add `\set@curr@file@nosearch` `\@expl@@@filehook@set@curr@file@@nNN` at the end, after `\@curr@file` is set.

`\curr@file` A file name is built using `\expandafter\string\csname<filename>\endcsname` to avoid expanding utf8 active characters. The `\csname` expands the normalization machinery and the routine to resolve a file substitution, returning a control sequence with the same name as the file.

It happens that when `<filename>` is empty, the generated control sequence is `\csname\endcsname`, and doing `\string` on that results in the file `csnameendcsname.tex`. To guard against that we `\ifx`-compare the generated control sequence with the empty `csname`. To do so, `\csname\endcsname` has to be defined, otherwise it would be equal to `\relax` and we would have false positives. Here we define `\csname\endcsname` to expand to itself to avoid it matching the definition of some other control sequence.

```
267 </2ekernel>
268 <*2ekernel | latexrelease>
269 <latexrelease>\IncludeInRelease{2022/06/01}%
270 <latexrelease>          {\set@curr@file}{Setting current file name}%
271 \def\set@curr@file{%
272   \begingroup
273   \set@curr@file@aux}
274 \edef\set@curr@file@nosearch{%
275   \begingroup
276   \let\noexpand\input@path\noexpand\@empty
277   \csname seq_clear:N\endcsname
278   \expandafter\noexpand\csname l_file_search_path_seq\endcsname
279   \noexpand\set@curr@file@aux}
280 \def\set@curr@file@aux#1{%
281   \escapechar\m@ne
282   \let\protect\string
283   \edef~{\string~}%
284   \expandafter\def\csname\expandafter\endcsname
285   \expandafter{\csname\endcsname}%
```

Two file names are set here: `\@curr@file@reqd` which is the file requested by the user, and `\@curr@file` which should be the same, except when we have a file substitution, in which case it holds the actual loaded file. `\@curr@file` is resolved first, to check if a substitution happens. If it doesn't, `\@expl@@@filehook@if@file@replaced@@TF` short-cuts and just copies `\@curr@file`, otherwise the full normalization procedure is executed.

At this stage the file name is parsed and normalized, but if the input doesn't have an extension, the default `.tex` is *not* added to `\@curr@file` because for applications other than `\input` (graphics, for example) the default extension may not be `.tex`. First check if the input has an extension, then if the input had no extension, call `\@expl@@@filehook@drop@extension@@N`. In case of a file substitution, `\@curr@file` will have an extension.

```
286 \@expl@@@filehook@if@no@extension@@nTF{#1}%
```



```

287     {\@tempwattrue}{\@tempwafalse}%
288     \@kernel@make@file@csname\@curr@file
289     \@expl@@@filehook@resolve@file@subst@@w {#1}%
290     \@expl@@@filehook@if@file@replaced@@TF
291     {\@kernel@make@file@csname\@curr@file@reqd
292     \@expl@@@filehook@normalize@file@name@@w{#1}%
293     \if@tempswa \@expl@@@filehook@drop@extension@@N\@curr@file@reqd \fi}%
294     {\if@tempswa \@expl@@@filehook@drop@extension@@N\@curr@file \fi
295     \global\let\@curr@file@reqd\@curr@file}%
296     \@expl@@@filehook@clear@replacement@flag@@
297     \endgroup}
298 </2ekernel | latexrelease>
299 <latexrelease>\EndIncludeInRelease

300 <latexrelease>\IncludeInRelease{2021/06/01}%
301 <latexrelease>     {\set@curr@file}{Setting current file name}%
302 <latexrelease>\def\set@curr@file#1{%
303 <latexrelease>  \begingroup
304 <latexrelease>    \escapechar\m@ne
305 <latexrelease>    \let\protect\string
306 <latexrelease>    \edef~{\string~}%
307 <latexrelease>    \expandafter\def\csname\expandafter\endcsname
308 <latexrelease>      \expandafter{\csname\endcsname}%
309 <latexrelease>    \@expl@@@filehook@if@no@extension@@nTF{#1}%
310 <latexrelease>    {\@tempwattrue}{\@tempwafalse}%
311 <latexrelease>    \@kernel@make@file@csname\@curr@file
312 <latexrelease>    \@expl@@@filehook@resolve@file@subst@@w {#1}%
313 <latexrelease>    \@expl@@@filehook@if@file@replaced@@TF
314 <latexrelease>    {\@kernel@make@file@csname\@curr@file@reqd
315 <latexrelease>    \@expl@@@filehook@normalize@file@name@@w{#1}%
316 <latexrelease>    \if@tempswa \@expl@@@filehook@drop@extension@@N\@curr@file@reqd \fi}%
317 <latexrelease>    {\if@tempswa \@expl@@@filehook@drop@extension@@N\@curr@file \fi
318 <latexrelease>    \global\let\@curr@file@reqd\@curr@file}%
319 <latexrelease>    \@expl@@@filehook@clear@replacement@flag@@
320 <latexrelease>  \endgroup}
321 <latexrelease>\let\set@curr@file@nosearch\@undefined
322 <latexrelease>\EndIncludeInRelease

323 <latexrelease>\IncludeInRelease{2020/10/01}%
324 <latexrelease>     {\set@curr@file}{Setting current file name}%
325 <latexrelease>\def\set@curr@file#1{%
326 <latexrelease>  \begingroup
327 <latexrelease>    \escapechar\m@ne
328 <latexrelease>    \expandafter\def\csname\expandafter\endcsname
329 <latexrelease>      \expandafter{\csname\endcsname}%
330 <latexrelease>    \@expl@@@filehook@if@no@extension@@nTF{#1}%
331 <latexrelease>    {\@tempwattrue}{\@tempwafalse}%
332 <latexrelease>    \@kernel@make@file@csname\@curr@file
333 <latexrelease>    \@expl@@@filehook@resolve@file@subst@@w {#1}%
334 <latexrelease>    \@expl@@@filehook@if@file@replaced@@TF
335 <latexrelease>    {\@kernel@make@file@csname\@curr@file@reqd
336 <latexrelease>    \@expl@@@filehook@normalize@file@name@@w{#1}%
337 <latexrelease>    \if@tempswa \@expl@@@filehook@drop@extension@@N\@curr@file@reqd \fi}%
338 <latexrelease>    {\if@tempswa \@expl@@@filehook@drop@extension@@N\@curr@file \fi
339 <latexrelease>    \global\let\@curr@file@reqd\@curr@file}%

```

```

340 <latexrelease> \expl@@@filehook@clear@replacement@flag@@
341 <latexrelease> \endgroup}
342 <latexrelease>\let\set@curr@file@nosearch\@undefined
343 <latexrelease>\EndIncludeInRelease

344 <latexrelease>\IncludeInRelease{2019/10/01}%
345 <latexrelease> {\set@curr@file}{Setting current file name}%
346 <latexrelease>\def\set@curr@file#1{%
347 <latexrelease> \begingroup
348 <latexrelease> \escapechar\m@ne
349 <latexrelease> \xdef\@curr@file{%
350 <latexrelease> \expandafter\expandafter\expandafter\unquote@name
351 <latexrelease> \expandafter\expandafter\expandafter{%
352 <latexrelease> \expandafter\string
353 <latexrelease> \csname\@firstofone#1\@empty\endcsname}}%
354 <latexrelease> \endgroup
355 <latexrelease>}
356 <latexrelease>\let\set@curr@file@nosearch\@undefined
357 <latexrelease>\EndIncludeInRelease

358 <latexrelease>\IncludeInRelease{0000/00/00}%
359 <latexrelease> {\set@curr@file}{Setting current file name}%
360 <latexrelease>\let\set@curr@file\@undefined
361 <latexrelease>\let\set@curr@file@nosearch\@undefined
362 <latexrelease>\EndIncludeInRelease
363 <*2ekernel>

```

(End definition for \set@curr@file and others.)

```

\@filehook@set@CurrentFile      Todo: This should get internalized using @expl@ names
\@kernel@make@file@csname
\@set@curr@file@aux
364 </2ekernel>
365 <*2ekernel | latexrelease>
366 <latexrelease>\IncludeInRelease{2020/10/01}%
367 <latexrelease> {\@kernel@make@file@csname}{Make file csname}%
368 \def\@kernel@make@file@csname#1#2#3{%
369 \xdef#1{\expandafter\@set@curr@file@aux
370 \csname\expandafter#2\@firstofone#3\@nil\endcsname}}

```

This auxiliary compares \<filename> with \csname\endcsname to check if the empty .tex file was requested.

```

371 \def\@set@curr@file@aux#1{%
372 \expandafter\ifx\csname\endcsname#1%
373 .tex\else\string#1\fi}

```

Then we call \expl@@@filehook@set@curr@file@@nNN once for \@curr@file to set \CurrentFile(Path)Used and once for \@curr@file@reqd to set \CurrentFile(Path). Here too the slower route is only used if a substitution happened, but here \expl@@@filehook@if@file@replaced@@TF can't be used because the flag is reset at the \endgroup above, so we check if \@curr@file and \@curr@file@reqd differ. This macro is issued separate from \set@curr@file because it changes \CurrentFile, and side-effects would quickly get out of control.

```

374 \def\@filehook@set@CurrentFile{%
375 \expl@@@filehook@set@curr@file@@nNN{\@curr@file}%
376 \CurrentFileUsed\CurrentFilePathUsed
377 \ifx\@curr@file@reqd\@curr@file

```

```

378 \let\CurrentFile\CurrentFileUsed
379 \let\CurrentFilePath\CurrentFilePathUsed
380 \else
381 \expl@@@filehook@set@curr@file@nNN{\@curr@file@reqd}%
382 \CurrentFile\CurrentFilePath
383 \fi}
384 </2ekernel | latexrelease>
385 <latexrelease>\EndIncludeInRelease
386 <*2ekernel>

(End definition for \@filehook@set@CurrentFile, \@kernel@make@file@csname, and
\@set@curr@file@aux.)

```

`\@@_set_curr_file:nNN` When inputting a file, `\set@curr@file` does a file lookup (in `\input@path` and `\l_file_search_path_seq`) and returns the actual file name (`<base>` plus `<ext>`) in `\CurrentFileUsed`, and in case there's a file substitution, the requested file in `\CurrentFile` (otherwise both are the same). Only the base and extension are returned, regardless of the input (both `path/to/file.tex` and `file.tex` end up as `file.tex` in `\CurrentFile`). The path is returned in `\CurrentFilePath`, in case it's needed.

```

387 </2ekernel>
388 <*2ekernel | latexrelease>
389 <latexrelease>\IncludeInRelease{2020/10/01}%
390 <latexrelease> \@@_set_curr_file:nNN{Set curr file}%
391 \ExplSyntaxOn
392 <@@=filehook>
393 \cs_new_protected:Npn \__filehook_set_curr_file:nNN #1
394 {
395 \exp_args:Nf \__filehook_file_parse_full_name:nN {#1}
396 \__filehook_set_curr_file_assign:nnnNN
397 }
398 \cs_new_protected:Npn \__filehook_set_curr_file_assign:nnnNN #1 #2 #3 #4 #5
399 {
400 \str_set:Nn #5 {#1}
401 \str_set:Nn #4 {#2#3}
402 }
403 \ExplSyntaxOff
404 </2ekernel | latexrelease>
405 <latexrelease>\EndIncludeInRelease
406 <*2ekernel>

(End definition for \@@_set_curr_file:nNN and \@@_set_curr_file_assign:nnnNN.)

```

## 2.7 Replacing a file and detecting loops

`\_filehook_resolve_file_subst:w` Start by sanitizing the file with `\__filehook_file_parse_full_name:nN` then do `\__filehook_file_subst_begin:nnn{\<path>}{\<name>}{\<ext>}`.  
`\_filehook_normalize_file_name:w`  
`\_filehook_file_name_compose:nnn`

```

407 </2ekernel>
408 <*2ekernel | latexrelease>
409 <latexrelease>\IncludeInRelease{2020/10/01}%
410 <latexrelease> {\_filehook_resolve_file_subst:w}{Replace files detect loops}%
411 \ExplSyntaxOn
412 \cs_new:Npn \__filehook_resolve_file_subst:w #1 \@nil
413 { \__filehook_file_parse_full_name:nN {#1} \__filehook_file_subst_begin:nnn }
414 \cs_new:Npn \__filehook_normalize_file_name:w #1 \@nil

```

```

415 { \_filehook_file_parse_full_name:nN {#1} \_filehook_file_name_compose:nnn }
416 \cs_new:Npn \_filehook_file_name_compose:nnn #1 #2 #3
417 { \tl_if_empty:nF {#1} { #1 / } #2#3 }

```

Since the file replacement is done expandably in a `\csname`, use a flag to remember if a substitution happened. We use this in `\set@curr@file` to short-circuit some of it in case no substitution happened (by far the most common case, so it's worth optimizing). The flag raised during the file substitution algorithm must be explicitly cleared after the `\_filehook_if_file_replaced:TF` conditional is no longer needed, otherwise further uses of `\_filehook_if_file_replaced:TF` will wrongly return true.

```

418 \flag_new:n { \_filehook_file_replaced }
419 \cs_new:Npn \_filehook_if_file_replaced:TF #1 #2
420 { \flag_if_raised:nTF { \_filehook_file_replaced } {#1} {#2} }
421 \cs_new_protected:Npn \_filehook_clear_replacement_flag:
422 { \flag_clear:n { \_filehook_file_replaced } }

```

First off, start by checking if the current file ( $\langle name \rangle + \langle ext \rangle$ ) has a declared substitution. If not, then just put that as the name (including a possible  $\langle path \rangle$  in this case): this is the default case with no substitutions, so it's the first to be checked. The auxiliary `\_filehook_file_subst_tortoise_hare:nn` sees that there's no replacement for `#2#3` and does nothing else.

```

423 \cs_new:Npn \_filehook_file_subst_begin:nnn #1 #2 #3
424 {
425   \_filehook_file_subst_tortoise_hare:nn { #2#3 } { #2#3 }
426   { \_filehook_file_name_compose:nnn {#1} {#2} {#3} }
427 }
428 \ExplSyntaxOff
429 </2ekernel|latexrelease>
430 <latexrelease>\EndIncludeInRelease
431 <*2ekernel>

```

## 2.7.1 The Tortoise and Hare algorithm

If there is a substitution ( $\langle true \rangle$  in the first `\cs_if_exist:cTF` below), then first check if there is no substitution down the line: this should be the second most common case, of one file replaced by another. In that case just leave the substitution there and the job is done. If any substitution happens, then the `\flag \_filehook_file_replaced` is raised (conditionally, because checking if a flag is raised is much faster than raising it over and over again).

If, however there are more substitutions, then we need to check for a possible loop in the substitutions, which would otherwise put  $\text{\TeX}$  in an infinite loop if just an exhaustive expansion was used.

To detect a loop, the *Tortoise and Hare* algorithm is used. The name of the algorithm is an analogy to Aesop's fable, in which the Hare outruns a Tortoise. The two pointers here are the csnames which contains each file replacement, both of which start at the position zero, which is the file requested. In the inner part of the macro below, `\_filehook_file_subst_loop:cc` is called with `\@file-subst@<file>` and `\@file-subst@\@file-subst@<file>`; that is, the substitution of  $\langle file \rangle$  and the substitution of that substitution: the Tortoise walks one step while the Hare walks two.

Within `\_filehook_file_subst_loop:NN` the two substitutions are compared, and if they lead to the same file it means that there is a loop in the substitutions. If there's

no loop, `\__filehook_file_subst_tortoise_hare:nn` is called again with the Tortoise at position 1 and the hare at 2. Again, the substitutions are checked ahead of the Hare pointer to check that it won't run too far; in case there is no loop in the declarations, eventually one of the `\cs_if_exist:cTF` below will go *false* and the algorithm will end; otherwise it will run until the Hare reaches the same spot as the tortoise and a loop is detected.

```

432 </2ekernel>
433 <*2ekernel|latexrelease>
434 <latexrelease>\IncludeInRelease{2020/10/01}%
435 <latexrelease> {\__filehook_file_subst_tortoise_hare:nn}{Tortoise and Hare}%
436 \ExplSyntaxOn
437 \cs_new:Npn \__filehook_file_subst_tortoise_hare:nn #1 #2 #3
438 {
439   \cs_if_exist:cTF { @file-subst@ #2 }
440   {
441     \flag_if_raised:nF { __filehook_file_replaced }
442     { \flag_raise:n { __filehook_file_replaced } }
443     \cs_if_exist:cTF { @file-subst@ \use:c { @file-subst@ #2 } }
444     {
445       \__filehook_file_subst_loop:cc
446       { @file-subst@ #1 }
447       { @file-subst@ \use:c { @file-subst@ #2 } }
448     }
449     { \use:c { @file-subst@ #2 } }
450   }
451   { #3 }
452 }

```

This is just an auxiliary to check if a loop was found, and continue the algorithm otherwise. If a loop is found, the `.tex` file is used as fallback and `\__filehook_file_subst_cycle_error:cN` is called to report the error.

```

453 \cs_new:Npn \__filehook_file_subst_loop:NN #1 #2
454 {
455   \token_if_eq_meaning:NNTF #1 #2
456   {
457     .tex
458     \__filehook_file_subst_cycle_error:cN { @file-subst@ #1 } #1
459   }
460   { \__filehook_file_subst_tortoise_hare:nn {#1} {#2} {#2} }
461 }
462 \cs_generate_variant:Nn \__filehook_file_subst_loop:NN { cc }

```

Showing this type of error expandably is tricky, as we have a very limited amount of characters to show and a potentially large list. As a work around, several errors are printed, each showing one step of the loop, until all the error messages combined show the loop.

```

463 \cs_new:Npn \__filehook_file_subst_cycle_error:NN #1 #2
464 {
465   \msg_expandable_error:nnff { latex2e } { file-cycle }
466   {#1} { \use:c { @file-subst@ #1 } }
467   \token_if_eq_meaning:NNTF #1 #2
468   { \__filehook_file_subst_cycle_error:cN { @file-subst@ #1 } #2 }
469 }

```

```

470 \cs_generate_variant:Nn \__filehook_file_subst_cycle_error:NN { c }
    And the error message:
471 \msg_new:nnn { latex2e } { file-cycle }
472   { File~loop!~#1~replaced~by~#2... }

(End definition for \__filehook_resolve_file_subst:w and others.)

473 \ExplSyntaxOff
474 \</2ekernel | latexrelease>
475 \<latexrelease>\EndIncludeInRelease
476 \<*2ekernel>
477 \<@@=>

```

## 2.8 Preventing a package from loading

We support the use case of preventing a package from loading but not any other type of files (e.g., classes).

```

\disable@package@load \disable@package@load defines \@pkg-disable@<package> to expand to some code #2
\reenable@package@load instead of loading the package.
\@disable@packageload@do
478 \</2ekernel>
479 \<*2ekernel | latexrelease>
480 \<latexrelease>\IncludeInRelease{2020/10/01}%
481 \<latexrelease>          {\disable@package@load}{Disable packages}%
482 \def\disable@package@load#1#2{%
483   \global\@namedef{\@pkg-disable@#1.\@pkgextension}{#2}}
484 \def\@disable@packageload@do#1#2{%
485   \ifundefined{\@pkg-disable@#1}{#2}%
486   {\@nameuse{\@pkg-disable@#1}}}

\reenable@package@load undefines \@pkg-disable@<package> to realow loading
a package.
487 \def\reenable@package@load#1{%
488   \global\expandafter\let
489   \csname \@pkg-disable@#1.\@pkgextension \endcsname \@undefined}
490 \</2ekernel | latexrelease>
491 \<latexrelease>\EndIncludeInRelease
492 \<latexrelease>\IncludeInRelease{0000/00/00}%
493 \<latexrelease>          {\disable@package@load}{Disable packages}%
494 \<latexrelease>
495 \<latexrelease>\let\disable@package@load \@undefined
496 \<latexrelease>\let\@disable@packageload@do\@undefined
497 \<latexrelease>\let\reenable@package@load \@undefined
498 \<latexrelease>\EndIncludeInRelease
499 \<*2ekernel>

(End definition for \disable@package@load, \reenable@package@load, and
\@disable@packageload@do. These functions are documented on page 879.)

```

## 2.9 High-level interfaces for L<sup>A</sup>T<sub>E</sub>X

None so far and the general feeling for now is that the hooks are enough. Packages like filehook, etc., may use them to set up their interfaces (samples are given below) but for the now the kernel will not provide any.

## 2.10 Internal commands needed elsewhere

Here we set up a few horrible (but consistent) L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> names to allow for internal commands to be used outside this module (and in parts that still use L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> syntax. We have to unset the @@ since we want double “at” sign in place of double underscores.

```

500 <@@=)
501 </2ekernel>
502 <*2ekernel | latexrelease>
503 <latexrelease>\IncludeInRelease{2020/10/01}%
504 <latexrelease>    {\@expl@@@filehook@if@no@extension@@nTF}{2e tmp interfaces}%
505 \ExplSyntaxOn

506 \cs_new_eq:NN \@expl@@@filehook@if@no@extension@@nTF
507                \__filehook_if_no_extension:nTF

508 \cs_new_eq:NN \@expl@@@filehook@set@curr@file@@nNN
509                \__filehook_set_curr_file:nNN

510 \cs_new_eq:NN \@expl@@@filehook@resolve@file@subst@@w
511                \__filehook_resolve_file_subst:w

512 \cs_new_eq:NN \@expl@@@filehook@normalize@file@name@@w
513                \__filehook_normalize_file_name:w

514 \cs_new_eq:NN \@expl@@@filehook@if@file@replaced@@TF
515                \__filehook_if_file_replaced:TF

516 \cs_new_eq:NN \@expl@@@filehook@clear@replacement@flag@@
517                \__filehook_clear_replacement_flag:

518 \cs_new_eq:NN \@expl@@@filehook@drop@extension@@N
519                \__filehook_drop_extension:N

520 \cs_new_eq:NN \@expl@@@filehook@file@push@@
521                \__filehook_file_push:

522 \cs_new_eq:NN \@expl@@@filehook@file@pop@@
523                \__filehook_file_pop:

524 \cs_new_eq:NN \@expl@@@filehook@file@pop@assign@@nnnn
525                \__filehook_file_pop_assign:nnnn

526 \ExplSyntaxOff

```

This one specifically has to be undefined because it is left over in the input stream from `\InputIfFileExists` and executed when `latexrelease` is loaded. It cannot be `\let` to `\@undefined` otherwise it would error as well, so it is `\let` to `\relax` to be silently ignored when loading `\latexrelease`.

```

527 </2ekernel | latexrelease>
528 <latexrelease>\EndIncludeInRelease
529 <latexrelease>
530 <latexrelease>\IncludeInRelease{0000/00/00}%
531 <latexrelease>    {\@expl@@@filehook@if@no@extension@@nTF}{2e tmp interfaces}%
532 <latexrelease>\let\@expl@@@filehook@file@pop@@\relax
533 <latexrelease>\EndIncludeInRelease
534 <*2ekernel>

```

This ends the kernel code in this file.

```

535 </2ekernel>

```

### 3 A sample package for structuring the log output

```

536 <*structuredlog>
537 <@@=filehook>

538 \ProvidesExplPackage
539     {structuredlog}{\ltfilehookdate}{\ltfilehookversion}
540     {Structuring the TeX transcript file}

\g_filehook_nesting_level_int Stores the current package nesting level.
541 \int_new:N \g_filehook_nesting_level_int
Initialise the counter with the number of files in the \@currnamestack (the number of
items divided by 3) minus one, because this package is skipped when printing to the log.
542 \int_gset:Nn \g_filehook_nesting_level_int
543     { ( \tl_count:N \@currnamestack ) / 3 - 1 }

(End definition for \g_filehook_nesting_level_int.)

\__filehook_log_file_record:n This macro is responsible for increasing and decreasing the file nesting level, as well as
printing to the log. The argument is either STOPTART or STOP and the action it takes on
the nesting integer depends on that.
544 \cs_new_protected:Npn \__filehook_log_file_record:n #1
545 {
546     \str_if_eq:nnT {#1} {START} { \int_gincr:N \g_filehook_nesting_level_int }
547     \iow_term:x
548     {
549         \prg_replicate:nn { \g_filehook_nesting_level_int } { = } ~
550         ( LEVEL ~ \int_use:N \g_filehook_nesting_level_int \c_space_tl #1 ) ~
551         \CurrentFileUsed
If there was a file replacement, show that as well:
552         \str_if_eq:nnF \CurrentFileUsed \CurrentFile
553         { ~ ( \CurrentFile \c_space_tl requested ) }
554         \iow_newline:
555     }
556     \str_if_eq:nnT {#1} {STOP} { \int_gdecr:N \g_filehook_nesting_level_int }
557 }

Now just hook the macro above in the generic file/before...
558 \AddToHook{file/before}{ \__filehook_log_file_record:n { START } }
...and file/after hooks. We don't want to install the file/after hook immediately,
because that would mean it is the first time executed when the package finishes. We
therefore put the declaration inside \AddToHookNext so that it gets only installed when
we have left this package.
559 \AddToHookNext{file/after}
560 { \AddToHook{file/after}{ \__filehook_log_file_record:n { STOP } } }

(End definition for \__filehook_log_file_record:n.)

561 <@@=
562 </structuredlog>

```



## 4 Package emulations

### 4.1 Package `atveryend` emulation

With the new hook management and the hooks in `\enddocument` all of `atveryend` is taken care of. We can make an emulation only here after the substitution functionality is available:

```
563 <*2kernel>
564 \declare@file@substitution{atveryend.sty}{atveryend-ltx.sty}
565 </2kernel>
```

Here is the package file we point to:

```
566 <*atveryend-ltx>
567 \ProvidesPackage{atveryend-ltx}
568 [2020/08/19 v1.0a
569 Emulation of the original atveryend package^^Jwith kernel methods]
```

Here are new definitions for its interfaces now pointing to the hooks in `\enddocument`

```
570 \newcommand\AfterLastShipout {\AddToHook{enddocument/afterlastpage}}
571 \newcommand\AtVeryEndDocument {\AddToHook{enddocument/afteraux}}
```

Next one is a bit of a fake, but the result should normally be as expected. If not, one needs to add a rule to sort the code chunks in `enddocument/info`.

```
572 \newcommand\AtEndAfterFileList{\AddToHook{enddocument/info}}
573 \newcommand\AtVeryVeryEnd {\AddToHook{enddocument/end}}
```

`\BeforeClearDocument` This one is the only one we don't implement or rather don't have a dedicated hook in the code.

```
574 \ExplSyntaxOn
575 \newcommand\BeforeClearDocument[1]
576 { \AtEndDocument{#1}
577   \atveryend@DEPRECATED{BeforeClearDocument \tl_to_str:n{#1}}
578 }
579 \cs_new:Npn\atveryend@DEPRECATED #1
580 {\iow_term:x{=====~DEPRECATED~USAGE~#1~=====}}
581 \ExplSyntaxOff
```

*(End definition for `\BeforeClearDocument`.)*

```
582 </atveryend-ltx>
```

## File X

# ltshipout.dtx

## 1 Introduction

The code provides an interface to the `\shipout` primitive of  $\text{\TeX}$  which is called when a finished pages is finally “shipped out” to the target output file, e.g., the `.dvi` or `.pdf` file. A good portion of the code is based on ideas by Heiko Oberdiek implemented in his packages `atbegshi` and `atenddvi` even though the interfaces are somewhat different.<sup>42</sup>

### 1.1 Overloading the `\shipout` primitive

---

**`\shipout`** With this implementation  $\text{\TeX}$ ’s shipout primitive is no longer available for direct use. Instead `\shipout` is running some (complicated) code that picks up the box to be shipped out regardless of how that is done, i.e., as a constructed `\vbox` or `\hbox` or as a box register.

It then stores it in a named box register. This box can then be manipulated through a set of hooks after which it is shipped out for real.

Each shipout that actually happens (i.e., where the material is not discarded for one or the other reason) is recorded and the total number is available in a readonly variable and in a  $\text{\LaTeX}$  counter.

---

**`\RawShipout`** This command implements a simplified shipout that bypasses the foreground and background hooks, e.g., only `shipout/firstpage` and `shipout/lastpage` are executed and the total shipout counters are incremented.

The command doesn’t use `\ShipoutBox` but its own private box register so that it can be used inside of shipout hooks to do some additional shipouts while already in the output routine with the current page being stored in `\ShipoutBox`. It does have access to `\ShipoutBox` if it is used in `shipout/before` (or `shipout/after`) and can use its content.

It is safe to use it in `shipout/before` or `shipout/after` but not necessarily in the other `shipout/...` hooks as they are intended for special processing.

---

<sup>42</sup>Heiko’s interfaces are emulated by the kernel code, if a document requests his packages, so older documents will continue to work.

---

<code>\ShipoutBox</code> <code>\l_shipout_box</code>	This box register is called <code>\ShipoutBox</code> (alternatively available via the L3 name <code>\l_shipout_box</code> ).
---	--

---

This box is a “local” box and assignments to it should be done only locally. Global assignments (as done by some packages with older code where this box is known as 255) may work but they are conceptually wrong and may result in errors under certain circumstances.

During the execution of `shipout/before` this box contains the accumulated material for the page, but not yet any material added by other shipout hooks. During execution of `shipout/after`, i.e., after the shipout has happened, the box also contains any background or foreground material.

Material from the hooks `shipout/firstpage` or `shipout/lastpage` is not included (but only used during the actual shipout) to facilitate reuse of the box data (e.g., `shipout/firstpage` material should never be added to a later page of the output).

---

<code>\l_shipout_box_ht_dim</code> <code>\l_shipout_box_dp_dim</code> <code>\l_shipout_box_wd_dim</code> <code>\l_shipout_box_ht_plus_dp_dim</code>	
--	--

---

The shipout box dimensions are available in the L3 registers `\l_shipout_box_ht_dim`, etc. (there are no L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> names).<sup>43</sup> These variables can be used inside the hook code for `shipout/before`, `shipout/foreground` and `shipout/background` if needed.

## 1.2 Provided hooks

---

<code>shipout/before</code> <code>shipout/after</code> <code>shipout/foreground</code> <code>shipout/background</code> <code>shipout/firstpage</code> <code>shipout/lastpage</code>	The code for <code>\shipout</code> offers a number of hooks into which packages (or the user) can add code to support different use cases. These are:  <b><code>shipout/before</code></b> This hook is executed after the finished page has been stored in <code>\ShipoutBox</code> / <code>\l_shipout_box</code> . It can be used to alter that box content or to discard it completely (see <code>\DiscardShipoutBox</code> below).
--	---

---

You can use `\RawShipout` inside this hook for special use cases. It can make use of `\ShipoutBox` (which doesn’t yet include the background and foreground material).

**Note:** It is not possible (or say advisable) to try and use this hook to typeset material with the intention to return it to main vertical list, it will go wrong and give unexpected results in many cases—for starters it will appear after the current page not before or it will vanish or the vertical spacing will be wrong!

**`shipout/background`** This hook adds a picture environment into the background of the page with the (0,0) coordinate in the top-left corner using a `\unitlength` of 1pt. It should therefore only receive `\put` commands or other commands suitable in a `picture` environment and the vertical coordinate values would normally be negative.

---

<sup>43</sup>Might need changing, but HO’s version as strings is not really helpful I think).

Technically this is implemented by adding a zero-sized `\hbox` as the very first item into the `\ShipoutBox` containing that `picture` environment. Thus the rest of the box content will overprint what ever is typeset by that hook.

**shipout/foreground** This hook adds a picture environment into the foreground of the page with the (0,0) coordinate in the top-left corner using a `\unitlength` of 1pt.

Technically this is implemented by adding a zero-sized `\hbox` as the very last item into the `\ShipoutBox` and raising it up so that it still has its (0,0) point in the top-left corner. But being placed after the main box content it will be typeset later and thus overprints it (i.e., is in the foreground).

**shipout/firstpage** The material from this hook is executed only once at the very beginning of the first output page that is shipped out (i.e., not discarded at the last minute). It should only contain `\special` or similar commands needed to direct post processors handling the .dvi or .pdf output.<sup>44</sup>

This hook is added to the very first page regardless of how it is shipped out (i.e., with `\shipout` or `\RawShipout`).

**shipout/lastpage** The corresponding hook to add `\specials` at the very end of the output file. It is only executed on the very last page of the output file — or rather on the page that L<sup>A</sup>T<sub>E</sub>X believes is the last one. Again it is executed regardless of the shipout method.

It may not be possible for L<sup>A</sup>T<sub>E</sub>X to correctly determine which page is the last one without several reruns. If this happens and the hook is non-empty then L<sup>A</sup>T<sub>E</sub>X will add an extra page to place the material and also request a rerun to get the correct placement sorted out.

**shipout/after** This hook is executed after a shipout has happened. If the shipout box is discarded this hook is not looked at.

You can use `\RawShipout` inside this hook for special use cases and the main `\ShipoutBox` is still available at this point (but in contrast to `shipout/before` it now includes the background and foreground material).

**Note:** Just like `shipout/before` this hook is not meant to be used for adding typeset material back to the main vertical list—it might vanish or the vertical spacing will be wrong!

As mentioned above the hook `shipout/before` is executed first and can manipulate the prepared shipout box stored in `\ShipoutBox` or set things up for use in `\write` during the actual shipout. It is even run if there was a `\DiscardShipoutBox` request in the document.

The other hooks (except `shipout/after`) are added inside hboxes to the box being shipped out in the following order:

<code>shipout/firstpage</code>	only on the first page
<code>shipout/background</code>	
<code>&lt;boxed content of \ShipoutBox&gt;</code>	
<code>shipout/foreground</code>	
<code>shipout/lastpage</code>	only on the last page

---

<sup>44</sup>In L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> that was already existing, but implemented using a box register with the name `\@begindvibox`.

If any of the hooks has no code then that particular no box is added at that point.

Once the (page) box has been shipped out the `shipout/after` hook is called (while you are still inside the output routine). It is not called if the shipout box was discarded.

In a document that doesn't produce pages, e.g., only makes `\typeouts`, none of the hooks are ever executed (as there is no `\shipout`) not even the `shipout/lastpage` hook.

If `\RawShipout` is used instead of `\shipout` then only the hooks `shipout/firstpage` and `shipout/lastpage` are executed (on the first or last page), all others are bypassed.

### 1.3 Legacy L<sup>A</sup>T<sub>E</sub>X commands

<hr/> <code>\AtBeginDvi</code>	<code>\AtBeginDvi {&lt;code&gt;}</code>
<code>\AtEndDvi</code> <hr/>	<code>\AtBeginDvi</code> is the existing L <sup>A</sup> T <sub>E</sub> X 2 <sub>ε</sub> interface to fill the <code>shipout/firstpage</code> hook. This is not really a good name as it is not just supporting <code>.dvi</code> but also <code>.pdf</code> output or <code>.xdv</code> . <code>\AtEndDvi</code> is the counterpart that was not available in the kernel but only through the package <code>atenddvi</code> . It fills the <code>shipout/lastpage</code> hook.

Neither interface can set a code label but uses the current default label.

As these two wrappers have been available for a long time we continue offering them (but not enhancing them, e.g., by providing support for code labels).

For new code we strongly suggest using the high-level hook management commands directly instead of “randomly-named” wrappers. This will lead to code that is easier to understand and to maintain and it also allows you to set code labels if needed.

For this reason we do not provide any other “new” wrapper commands for the above hooks in the kernel, but only keep the existing ones for backward compatibility.

### 1.4 Special commands for use inside the hooks

<hr/> <code>\DiscardShipoutBox</code> <code>\shipout_discard:</code> <hr/>	<code>\AddToHookNext {shipout/before} {...\DiscardShipoutBox...}</code> The <code>\DiscardShipoutBox</code> declaration (L3 name <code>\shipout_discard:</code> ) requests that on the next shipout the page box is thrown away instead of being shipped to the <code>.dvi</code> or <code>.pdf</code> file.
---	---

Typical applications wouldn't do this unconditionally, but have some processing logic that decides to use or not to use the page.

Note that if this declaration is used directly in the document it may depend on the placement to which page it applies, given that L<sup>A</sup>T<sub>E</sub>X output routine is called in an asynchronous manner! Thus normally one would use this only as part of the `shipout/before` code.

*Todo: Once we have a new mark mechanism available we can improve on that and make sure that the declaration applies to the page that contains it.*

In the `atbegshi` package there are a number of additional commands for use inside the `shipout/before` hook. They should normally not be needed any more as one can instead simply add code to the hooks `shipout/before`, `shipout/background` or `shipout/foreground`.<sup>45</sup> If `atbegshi` gets loaded then those commands become available as public functions with their original names as given below.

<sup>45</sup>If that assumption turns out to be wrong it would be trivial to change them to public functions (right now they are private).

## 1.5 Provided LuaTeX callbacks

---

**pre\_shipout\_filter** Under LuaTeX the `pre_shipout_filter` Lua callback is provided which gets called immediately before the shipout primitive gets invoked. The signature is

```
function(<node> head)
  return true
end
```

The `head` is the list node corresponding to the box to be shipped out. The return value should always be `true`.

## 1.6 Information counters

---

**\ReadonlyShipoutCounter** `\ifnum\ReadonlyShipoutCounter=...`  
**\g\_shipout\_readonly\_int** `\int_use:N \g_shipout_readonly_int % expl3 usage`

---

This integer holds the number of pages shipped out up to now (including the one to be shipped out when inside the output routine). More precisely, it is incremented only after it is clear that a page will be shipped out, i.e., after the `shipout/before` hook (because that might discard the page)! In contrast `shipout/after` sees the incremented value.

Just like with the `page` counter its value is only accurate within the output routine. In the body of the document it may be off by one as the output routine is called asynchronously!

Also important: it *must not* be set, only read. There are no provisions to prevent that restriction, but if you manipulate it, chaos will be the result. To emphasize this fact it is not provided as a L<sup>A</sup>T<sub>E</sub>X counter but as a T<sub>E</sub>X counter (i.e., a command), so `\Alph{\ReadonlyShipoutCounter}` etc, would not work.

---

**totalpages** `\arabic{totalpages}`  
**\g\_shipout\_totalpages\_int** `\int_use:N \g_shipout_totalpage_int % expl3 usage`

---

In contrast to `\ReadonlyShipoutCounter`, the `totalpages` counter is a L<sup>A</sup>T<sub>E</sub>X counter and incremented for each shipout attempt including those pages that are discarded for one or the other reason. Again `shipout/before` sees the counter before it is incremented. In contrast `shipout/after` sees the incremented value.

Furthermore, while it is incremented for each page, its value is never used by L<sup>A</sup>T<sub>E</sub>X. It can therefore be freely reset or changed by user code, for example, to additionally count a number of pages that are not build by L<sup>A</sup>T<sub>E</sub>X but are added in a later part of the process, e.g., cover pages or picture pages made externally.

Important: as this is a page-related counter its value is only reliable inside the output routine!

---

**\PreviousTotalPages** `\thetotalpages/\PreviousTotalPages`

---

Command that expands to the number of total pages from the previous run. If there was no previous run or if used in the preamble it expands to 0. Note that this is a command and not a counter, so in order to display the number in, say, Roman numerals you have to assign its value to a counter and then use `\Roman` on that counter.

## 1.7 Debugging shipout code

---

<code>\DebugShipoutsOn</code>	<code>\DebugShipoutsOn</code>
<code>\DebugShipoutsOff</code>	Turn the debugging of shipout code on or off. This displays changes made to the shipout data structures.
<code>\shipout_debug_on:</code>	
<code>\shipout_debug_off:</code>	

---

*Todo: This needs some rationalizing and may not stay this way.*

## 2 Emulating commands from other packages

The packages in this section are no longer necessary, but as they are used by other packages, they are emulated when they are explicitly loaded with `\usepackage` or `\RequirePackage`.

Please note that the emulation only happens if the package is explicitly requested, i.e., the commands documented below are not automatically available in the L<sup>A</sup>T<sub>E</sub>X kernel! If you write a new package we suggest to use the appropriate kernel hooks directly instead of loading the emulation.

### 2.1 Emulating atbegshi

---

<code>\AtBeginShipoutUpperLeft</code>	<code>\AddToHook {shipout/before}</code>
<code>\AtBeginShipoutUpperLeftForeground</code>	<code>{... \AtBeginShipoutUpperLeft{&lt;code&gt;}...}</code>

---

This adds a `picture` environment into the background of the shipout box expecting `<code>` to contain `picture` commands. The same effect can be obtained by simply using kernel features as follows:

`\AddToHook{shipout/background}{<code>}`

There is one technical difference: if `\AtBeginShipoutUpperLeft` is used several times each invocation is put into its own box inside the shipout box whereas all `<code>` going into `shipout/background` ends up all in the same box in the order it is added or sorted based on the rules for the hook chunks.

`\AtBeginShipoutUpperLeftForeground` is similar with the difference that the `picture` environment is placed in the foreground. To model it with the kernel functions use the hook `shipout/foreground` instead.

---

<code>\AtBeginShipoutAddToBox</code>	<code>\AddToHook {shipout/before} {... \AtBeginShipoutAddToBox{&lt;code&gt;}...}</code>
<code>\AtBeginShipoutAddToBoxForeground</code>	

---

These work like `\AtBeginShipoutUpperLeft` and `\AtBeginShipoutUpperLeftForeground` with the difference that `<code>` is directly placed into an `\hbox` inside the shipout box and not surrounded by a `picture` environment.

To emulate them using `shipout/background` or `shipout/foreground` you may have to wrap `<code>` into a `\put` statement but if the code is not doing any typesetting just adding it to the hook should be sufficient.

---

<code>\AtBeginShipoutBox</code>	This is the name of the shipout box as <code>atbegshi</code> knows it.
---------------------------------	--

---

---

**\AtBeginShipoutOriginalShipout**

---

This is the name of the `\shipout` primitive as `atbegshi` knows it. This bypasses all the mechanisms set up by the  $\text{\LaTeX}$  kernel and there are various scenarios in which it can therefore fail. It should only be used to run existing legacy `atbegshi` code but not in newly developed applications.

The kernel alternative is `\RawShipout` which is integrated with the  $\text{\LaTeX}$  mechanisms and updates, for example, the `\ReadonlyShipoutCounter` counter. Please use `\RawShipout` for new code if you want to bypass the before, foreground and background hooks.

---

**\AtBeginShipoutInit**

---

By default `atbegshi` delayed its action until `\begin{document}`. This command was forcing it in an earlier place. With the new concept it does nothing.

---

**\AtBeginShipout**

---

`\AtBeginShipout{<code>} \equiv \AddToHook{shipout/before}{<code>}`

---

**\AtBeginShipoutNext**

---

`\AtBeginShipoutNext{<code>} \equiv \AddToHookNext{shipout/before}{<code>}`

This is equivalent to filling the `shipout/before` hook by either using `\AddToHook` or `\AddToHookNext`, respectively.

---

**\AtBeginShipoutFirst**

---

---

**\AtBeginShipoutDiscard**

---

The `atbegshi` names for `\AtBeginDvi` and `\DiscardShipoutBox`.

## 2.2 Emulating everyshi

The `everyshi` package is providing commands to run arbitrary code just before the shipout starts. One point of difference: in the new shipout hooks the page is available as `\ShipoutBox` for inspection of change, one should not manipulate box 255 directly inside `shipout/before`, so old code doing this would change to use `\ShipoutBox` instead of 255 or `\@cc1v`.

---

**\EveryShipout**

---

`\EveryShipout{<code>} \equiv \AddToHook{shipout/before}{<code>}`

---

**\AtNextShipout**

---

`\AtNextShipout{<code>} \equiv \AddToHookNext{shipout/before}{<code>}`

However, most use cases for `everyshi` are attempts to put some picture or text into the background or foreground of the page and that can be done today simply by using the `shipout/background` and `shipout/foreground` hooks without any need to coding.

## 2.3 Emulating atenddvi

The `atenddvi` package implemented only a single command: `\AtEndDvi` and that is now available out of the box so the emulation makes the package a no-op.



## 2.4 Emulating everypage

This package patched the original `\@begindvi` hook and replaced it with its own version. Its functionality is now covered by the hooks offered by the kernel so that there is no need for such patching any longer.

---

<code>\AddEverypageHook</code>	<code>\AddEverypageHook{&lt;code&gt;} ≡</code> <code>\AddToHook{shipout/background}{\put(1in,-1in){&lt;code&gt;}}</code>
--------------------------------	---

---

`\AddEverypageHook` is adding something into the background of every page at a position of 1in to the right and 1in down from the top left corner of the page. By using the kernel hook directly you can put your material directly to the right place, i.e., use other coordinates in the `\put` statement above.

---

<code>\AddThispageHook</code>	<code>\AddThispageHook{&lt;code&gt;} ≡</code> <code>\AddToHookNext{shipout/background}{\put(1in,-1in){&lt;code&gt;}}</code>
-------------------------------	--

---

The `\AddThispageHook` wrapper is similar but uses `\AddToHookNext`.

## 3 The Implementation

1 `<@@=shipout>`

At the moment the whole module rolls back in one go, but if we make any modifications in later releases this will then need splitting.

2 `<*2ekernel | latexrelease>`  
3 `<latexrelease>\IncludeInRelease{2020/10/01}%`  
4 `<latexrelease> \{<shipout>\Hook management (shipout)\}%`  
5 `\ExplSyntaxOn`

### 3.1 Debugging

<code>\g__shipout_debug_bool</code>	Holds the current debugging state. 6 <code>\bool_new:N \g__shipout_debug_bool</code>
-------------------------------------	---

*(End definition for `\g__shipout_debug_bool`.)*

<code>\shipout_debug_on:</code>	Turns debugging on and off by redefining <code>\__shipout_debug:n</code> .
<code>\shipout_debug_off:</code>	
<code>\__shipout_debug:n</code>	7 <code>\cs_new_eq:NN \__shipout_debug:n \use_none:n</code>
<code>\__shipout_debug_gset:</code>	8 <code>\cs_new_protected:Npn \shipout_debug_on:</code>
	9 <code>{</code>
	10 <code>\bool_gset_true:N \g__shipout_debug_bool</code>
	11 <code>\__shipout_debug_gset:</code>
	12 <code>}</code>
	13 <code>\cs_new_protected:Npn \shipout_debug_off:</code>
	14 <code>{</code>
	15 <code>\bool_gset_false:N \g__shipout_debug_bool</code>
	16 <code>\__shipout_debug_gset:</code>
	17 <code>}</code>
	18 <code>\cs_new_protected:Npn \__shipout_debug_gset:</code>
	19 <code>{</code>
	20 <code>\cs_gset_protected:Npx \__shipout_debug:n ##1</code>
	21 <code>{ \bool_if:NT \g__shipout_debug_bool {##1} }</code>
	22 <code>}</code>

(End definition for `\shipout_debug_on:` and others. These functions are documented on page 903.)

`\ShipoutBox` The box filled with the page to be shipped out (both L<sup>3</sup> and L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> name).  
`\l_shipout_box`

```
23 \box_new:N \l_shipout_box
24 \cs_set_eq:NN \ShipoutBox \l_shipout_box
```

(End definition for `\ShipoutBox` and `\l_shipout_box`. These functions are documented on page 899.)

`\l__shipout_raw_box` The `\RawShipout` gets its own box but it is internal as there is no hook manipulation for it.

```
25 \box_new:N \l__shipout_raw_box
```

(End definition for `\l__shipout_raw_box`.)

`\__shipout_finalize_box:` For Lua<sub>T</sub><sub>E</sub>X invoke the `pre_shipout_filter` callback.

```
26 \sys_if_engine luatex:TF
27 {
28   \newprotectedluacmd \__shipout_finalize_box:
29   \exp_args:Nx \everyjob {
30     \exp_not:V \everyjob
31     \exp_not:N \lua_now:n {
32       luatexbase.create_callback('pre_shipout_filter', 'list')
33       local~call, getbox, setbox = luatexbase.call_callback, tex.getbox, tex.setbox~
34       lua.get_functions_table()[\the \allocationnumber] = function()
35         local~head = getbox(\the \l_shipout_box)
36         local~result = call('pre_shipout_filter', head)
37         if~not (result == head) then~
38           setbox(\the \l_shipout_box, result~or~nil)
39         end~
40       end
41     }
42   }
43 } {
44   \cs_set_eq:NN \__shipout_finalize_box: \scan_stop:
45 }
```

(End definition for `\__shipout_finalize_box:.`)

`\__shipout_execute:` This is going to be the code run by `\shipout`. The code follows closely the ideas from `atbegshi`, so not documenting that here for now.

```
46 \cs_set_protected:Npn \__shipout_execute: {
47   \tl_set:Nx \l__shipout_group_level_tl
48   { \int_value:w \tex_currentgrouplevel:D }
49   \tex_afterassignment:D \__shipout_execute_test_level:
50   \tex_setbox:D \l_shipout_box
51 }
```

(End definition for `\__shipout_execute:.`)

`\shipout` Overloading the `\shipout` primitive:

```
52 \cs_gset_eq:NN \shipout \__shipout_execute:
```

(End definition for `\shipout`. This function is documented on page 898.)

`\l__shipout_group_level_tl` Helper token list to record the group level at which `\__shipout_execute:` is encountered.

```
53 \tl_new:N \l__shipout_group_level_tl
```

(End definition for `\l__shipout_group_level_tl`.)

`\_shipout_execute_test_level:` If the group level has changed then we are still constructing `\l_shipout_box` and to continue we need to wait until the current group has finished, hence the `\tex_aftergroup:D`.

```
54 \cs_new:Npn \__shipout_execute_test_level: {
55   \int_compare:nNtT
56     \l__shipout_group_level_tl < \tex_currentgrouplevel:D
57     \tex_aftergroup:D \__shipout_execute_cont:
58 }
```

(End definition for `\_shipout_execute_test_level:.`)

`\__shipout_execute_cont:` This does the actual shipout running several hooks as part of it. The code for them is passed as argument #2 to #4 to `\__shipout_execute_main_cont:Nnnn`; the first argument is the box to be shipped out.

```
59 \cs_new:Npn \__shipout_execute_cont: {
60   \__shipout_execute_main_cont:Nnnn
61   \l_shipout_box
62   { \hook_use:n {shipout/before} }
63   { \hook_if_empty:nF {shipout/foreground}
64     { \__shipout_add_foreground_picture:n
65       { \hook_use:n {shipout/foreground} } } }
```

If the user hook for the background (`shipout/background`) has no code, there might still code in the kernel hook so we need to test for this too. We only test for the `\@kernel@before@shipout@background` though. If the `\@kernel@after@shipout@background` needs executing even if the user hook is empty then we can add another test (or the kernel could put something into the before hook).

```
66   \bool_lazy_and:nnF
67     { \hook_if_empty_p:n {shipout/background} }
68     { \tl_if_empty_p:N \@kernel@before@shipout@background }
69     { \__shipout_add_background_picture:n
70       { \@kernel@before@shipout@background
71         \hook_use:n {shipout/background}
72         \@kernel@after@shipout@background }
73     }
74   }
75   { \hook_use:n {shipout/after} }
76 }
```

(End definition for `\__shipout_execute_cont:.`)

`\_shipout_execute_main_cont:Nnnn` When we have reached this point the shipout box has been processed and is available in `\l_shipout_box` and ready for real ship out (unless it gets discarded during the process).

The three arguments hold hook code that is executed just before the actual shipout (#1), within the shipout adding background and foreground material (#2) and after the shipout has happened (#3). These are passed as arguments because the same code without those hooks is also used when doing a “raw” shipout implemented by `\RawShipout`. The only hook that is always executed is that for the very last page, i.e., `shipout/lastpage`.

First we quickly check if it is void (can't happen in the standard L<sup>A</sup>T<sub>E</sub>X output routine but `\shipout` might be called from a package that has some special processing logic). If it is void we aren't shipping anything out and processing ends.<sup>46</sup>

```

77 \cs_new:Npn \__shipout_execute_main_cont:Nnnn #1#2#3#4 {
78   \box_if_empty:NTF #1
79   { \@latex@warning@no@line{ Ignoring~ void~ shipout~ box } }
80   {

```

Otherwise we assume that we will ship something and prepare for final adjustments (in particular setting the state of `\protect` while we are running the hook code). We also save the current `\protect` state to restore it later.

```

81 %       \bool_gset_false:N \g_shipout_discard_bool % setting this would disable
82                                     % \DiscardShipoutBox on doc-level
83       \cs_set_eq:NN \__shipout_saved_protect: \protect
84       \set@typeset@protect

```

We also store the current shipout box dimension in registers, so that they can be used in the hook code.<sup>47</sup>

```

85       \__shipout_get_box_size:N #1

```

Then we execute the `shipout/before` hook (or nothing in case of `\RawShipout`).

```

86       #2

```

In `\g_shipout_totalpages_int` we count all shipout attempts so we increment that counter already here (the other one is incremented later when we know for sure that we do a `\shipout`).

We increment it after running the above hook so that the values for `\g_shipout_totalpages_int` and `\g_shipout_readonly_int` are in sync while the hook is executed (in the case that `totalpages` isn't manually altered or through discarding pages that is).

```

87       \int_gincr:N \g_shipout_totalpages_int

```

The above hook might contain code that requests the page to be discarded so we now test for it.

```

88       \bool_if:NTF \g_shipout_discard_bool
89       { \@latex@info@no@line{Completed~ page~ discarded}
90       \bool_gset_false:N \g_shipout_discard_bool

```

As we are discarding the page box and not shipping anything out, we need to do some house cleaning and reset T<sub>E</sub>X's deadcycles so that it doesn't complain about too many calls to the OR without any shipout.

```

91       \tex_deadcycles:D \c_zero_int

```

*Todo: In `atbegshi` the box was dropped but is that actually needed? Or the resetting of `\protect` to its kernel value?*

```

92 %       \group_begin:
93 %       \box_set_eq_drop:NN #1 #1
94 %       \group_end:
95 %       \cs_set_eq:NN \protect \exp_not:N
96       }

```

<sup>46</sup>In that case we don't reset the deadcycles, that would be up to the OR processing logic to do.

<sup>47</sup>This is not really necessary as the code could access them via `\box_ht:N`, etc., but it is perhaps convenient.

Even if there was no explicit request to discard the box it is possible that the code for the hook `shipout/before` has voided the box (by mistake or deliberately). We therefore test once more but this time make it a warning, because the best practice way is to use the request mechanism.

```

97      { \box_if_empty:NTF #1
98        { \@latex@warning@no@line { Ignoring~ void~ shipout~ box.
99          \MessageBreak The~ shipout~ box~ was~ voided~ by~ hook~ code }
100        }

```

Finally, if the box is still non-empty we are nearly ready to ship it out. First we increment the total page counter so that we can later test if we have reached the final page according to our available information.<sup>48</sup>

```

101      {
102        \int_gincr:N \g_shipout_readonly_int
103        \__shipout_debug:n {
104          \typeout{Absolute~ page~ =~ \int_use:N \g_shipout_readonly_int
105            \space (target:~ \@abspage@last)}
106        }

```

Then we store the box sizes again (as they may have changed) and then look at the hooks `shipout/foreground` and `shipout/background`. If either or both are non-empty we add a `picture` environment to the box (in the foreground and/or in the background) and execute the hook code inside that environment.

```

107      \__shipout_get_box_size:N #1

```

The first hook we run is the `shipout/firstpage` hook. This is only done once, then the `\__shipout_run_firstpage_hook:` command redefines itself to do nothing. If the hook contains `\specials` for integration at the top of the page they will be temporarily stored in a safe place and added later with `\__shipout_add_firstpage_specials:`.

```

108      \__shipout_run_firstpage_hook:

```

Run the hooks for background and foreground or, if this is called by `\RawShipout`, copy the box `\l__shipout_raw_box` to `\l_shipout_box` so that firstpage and lastpage material gets added if necessary (that is always done to `\l_shipout_box`).

```

109      #3

```

We then run `\__shipout_add_firstpage_specials:` that adds the content of the hook `shipout/firstpage` to the start of the first page (if non-empty). It is then redefined to do nothing on later pages.

```

110      \__shipout_add_firstpage_specials:

```

Then we check if we have to add the `shipout/lastpage` hook or the corresponding kernel hook because we have reached the last page. This test will be false for all but one (and hopefully the correct) page.

```

111      \int_compare:nNnT \@abspage@last = \g_shipout_readonly_int
112      { \bool_lazy_and:nnF
113        { \hook_if_empty_p:n {shipout/lastpage} }
114        { \tl_if_empty_p:N \@kernel@after@shipout@lastpage }
115        { \__shipout_debug:n { \typeout{Executing~ lastpage~ hook~
116          on~ page~ \int_use:N \g_shipout_readonly_int } } }
117      \__shipout_add_foreground_box:n
118      { \UseHook{shipout/lastpage}

```

<sup>48</sup>Doing that earlier would be wrong because we might end up with the last page counted but discard and then we have no place to add the final objects into the output file.

```

119         \@kernel@after@shipout@lastpage }
120         \bool_gset_true:N \g__shipout_lastpage_handled_bool

```

We record that we have handled the `shipout/lastpage` hook but only if we really did.

```

121     }
122   }
123   \__shipout_finalize_box:

```

Finally we run the actual  $\text{\TeX}$  primitive for `shipout`. As that will expand delayed `\write` statements inside the page in which protected commands should not expand we first change `\protect` to the appropriate definition for that case.

```

124         \cs_set_eq:NN \protect \exp_not:N
125         \tex_shipout:D \box_use:N \l_shipout_box

```

The `\l_shipout_box` may contain the firstpage material if this was the very first `shipout`. That makes it unsuitable for reuse in another `shipout`, so as a safety measure the next command resets `\l_shipout_box` to its earlier state if that is necessary. On later pages this is then a no-op.

```

126         \__shipout_drop_firstpage_specials:

```

The `shipout/after` hook (if in #4) needs to run with `\protected` commands again being executed, because that hook will “typeset” material added at the top of the next page.

```

127         \set@typeset@protect
128         #4
129     }
130 }

```

Restore the value of `\protect` in case `\shipout` is called outside of the output routine (where it is automatically restored because of the implicit group).

```

131     \cs_set_eq:NN \protect \__shipout_saved_protect:
132 }
133 }

```

(End definition for `\__shipout_execute_main_cont:Nnnn`.)

`\__shipout_execute_raw:` This implements the “raw” `shipout` which bypasses the before, foreground, background and after hooks. It follows the same pattern than `\__shipout_execute_raw:` except that it finally calls `\__shipout_execute_main_cont:Nnnn` with three empty arguments. instead of the hook code.

```

134 \cs_set_protected:Npn \__shipout_execute_raw: {
135   \tl_set:Nx \l__shipout_group_level_tl
136     { \int_value:w \tex_currentgrouplevel:D }
137   \tex_afterassignment:D \__shipout_execute_test_level_raw:
138   \tex_setbox:D \l__shipout_raw_box
139 }

140 \cs_new:Npn \__shipout_execute_test_level_raw: {
141   \int_compare:nNnT
142     \l__shipout_group_level_tl < \tex_currentgrouplevel:D
143     \tex_aftergroup:D \__shipout_execute_nohooks_cont:
144 }

```

Well, not totally empty arguments, we add some debugging if we are actually doing a `shipout`.

```

145 \cs_new:Npn \__shipout_execute_nohooks_cont: {
146   \__shipout_execute_main_cont:Nnnn \l__shipout_raw_box

```

```

147     {} { \_shipout_debug:n{ \typeout{Doing~ raw~ shipout~ ...} }
148         \box_set_eq:NN \l_shipout_box \l__shipout_raw_box } {}
149   }

(End definition for \_shipout_execute_raw: and \_shipout_execute_test_level_raw:.)

```

**\RawShipout** The interface name for raw shipout.

```

150 \cs_gset_eq:NN \RawShipout \_shipout_execute_raw:

(End definition for \RawShipout. This function is documented on page 898.)

```

**\\_shipout\_saved\_protect:** Remember the current \protect state.

```

151 \cs_new_eq:NN \_shipout_saved_protect: \protect

(End definition for \_shipout_saved_protect:.)

```

**shipout/before** Declaring all hooks for the shipout code.

**shipout/after**

**shipout/foreground**

**shipout/background**

**shipout/firstpage**

**shipout/lastpage**

```

152 \hook_new:n{shipout/before}
153 \hook_new:n{shipout/after}
154 \hook_new:n{shipout/foreground}
155 \hook_new:n{shipout/background}
156 \hook_new:n{shipout/firstpage}
157 \hook_new:n{shipout/lastpage}

(End definition for shipout/before and others. These functions are documented on page 899.)

```

**\@kernel@after@shipout@lastpage** And here are the internal kernel hooks going before or after the public ones where needed.

**\@kernel@before@shipout@background**

**\@kernel@after@shipout@background**

```

158 \let\@kernel@after@shipout@lastpage\@empty
159 \let\@kernel@before@shipout@background\@empty
160 \let\@kernel@after@shipout@background\@empty

(End definition for \@kernel@after@shipout@lastpage, \@kernel@before@shipout@background, and \@kernel@after@shipout@background.)

```

**\\_shipout\_run\_firstpage\_hook:** There are three commands to handle the **shipout/firstpage** hook: **\\_shipout\_run\_firstpage\_hook:**, **\\_shipout\_add\_firstpage\_specials:** and **\\_shipout\_drop\_firstpage\_specials:**.

That hook is supposed to contain **\specials** and similar material to be placed at the very beginning of the output page and so it needs careful placing to avoid that anything else gets in front of it. And this means we have to wait with this until other hooks such as **shipout/background** have added their bits. It is also important that such **\specials** show up only on the very first page, so if this page gets saved before **\shipout** for later reuse, we have to make sure that they aren't in the saved version.

In addition the hook may also contain code to be executed “first”, e.g., visible from code in **shipout/background** and this conflicts with adding the **\specials** late.

Therefore the processing is split into different parts: **\\_shipout\_run\_firstpage\_hook:** is done early and checks if there is any material in the hook.

```

161 \cs_new:Npn \_shipout_run_firstpage_hook: {
162   \hook_if_empty:nTF {shipout/firstpage}

```

If not then we define the other two commands to do nothing.

```

163     {
164         \cs_gset_eq:NN \__shipout_add_firstpage_specials: \prg_do_nothing:
165         \cs_gset_eq:NN \__shipout_drop_firstpage_specials: \prg_do_nothing:
166     }

```

If there is material we execute inside a box, which means any `\special` will end up in that box and any other code is executed and can have side effects (as long as they are global).

```

167     {
168         \hbox_set:Nn \l__shipout_firstpage_box { \UseHook{shipout/firstpage} }
169     }

```

Once we are here we change the definition to do nothing next time and we also change the command used to implement `\AtBeginDvi` to become a warning and not add further material to a hook that is never used again.

```

170     \cs_gset_eq:NN \__shipout_run_firstpage_hook: \prg_do_nothing:
171     \cs_gset:Npn \__shipout_add_firstpage_material:Nn ##1 ##2 {
172         \@latex@warning{ First~ page~ is~ already~ shipped~ out,~ ignoring
173             \MessageBreak \string##1 }
174     }
175 }

```

*(End definition for `\__shipout_run_firstpage_hook:`.)*

`\__shipout_add_firstpage_specials:`  
`\__shipout_drop_firstpage_specials:`

The `\__shipout_add_firstpage_specials:` then adds the `\specials` stored in `\l__shipout_firstpage_box` to the page to be shipped out when the time is ready. Note that if there was no material in the `shipout/firstpage` hook then this command gets redefined to do nothing. But for most documents there is something, e.g., some PostScript header, or some meta data declaration, etc. so by default we assume there is something to do.

```

176 \cs_new:Npn \__shipout_add_firstpage_specials: {

```

First we make a copy of the `\l__shipout_box` that we can restore it later on.

```

177     \box_set_eq:NN \l__shipout_raw_box \l__shipout_box

```

Adding something to the beginning means adding it to the background as that layer is done first in the output.

```

178     \__shipout_add_background_box:n { \hbox_unpack_drop:N \l__shipout_firstpage_box }

```

After the actual shipout `\__shipout_drop_firstpage_specials:` is run to restore the earlier content of `\l__shipout_box` and then redefines itself again to do nothing.

As a final act we change the definition to do nothing next time.

```

179     \cs_gset_eq:NN \__shipout_add_firstpage_specials: \prg_do_nothing:
180 }

```

The `\__shipout_drop_firstpage_specials:` is run after the shipout has occurred but before the `shipout/afterpage` hook is executed. That is the point where we have to restore the `\ShipoutBox` to its state without the `shipout/firstpage` material.

```

181 \cs_new:Npn \__shipout_drop_firstpage_specials: {
182     \box_set_eq:NN \l__shipout_box \l__shipout_raw_box

```

If there was no such material then `\__shipout_run_firstpage_hook:` will have changed the definition to a no-op already. Otherwise this is what we do here.

```

183     \cs_gset_eq:NN \__shipout_drop_firstpage_specials: \prg_do_nothing:
184 }

```



(End definition for `\_shipout\_add\_firstpage\_specials:` and  
`\_shipout\_drop\_firstpage\_specials:.`)

`\l\_shipout\_firstpage\_box` The box to hold any firstpage `\specials`.

185 `\box\_new:N \l\_shipout\_firstpage\_box`

(End definition for `\l\_shipout\_firstpage\_box.`)

`\g\_shipout\_lastpage\_handled\_bool` A boolean to signal if we have already handled the `shipout/lastpage` hook.

186 `\bool\_new:N \g\_shipout\_lastpage\_handled\_bool`

(End definition for `\g\_shipout\_lastpage\_handled\_bool.`)

`\_shipout\_add\_firstpage\_material:Nn` This command adds material to the `shipout/firstpage` hook. It is used in `\AtBeginDvi`, etc. The first argument is the command through which it is called. Initially this is ignored but once we are passed the first page it can be used to generate a warning message mentioning the right user command.

187 `\cs\_new:Npn \_shipout\_add\_firstpage\_material:Nn #1#2 {`  
 188 `\AddToHook{shipout/firstpage}{#2}`  
 189 `}`

(End definition for `\_shipout\_add\_firstpage\_material:Nn.`)

`\_shipout\_get\_box\_size:N` Store the box dimensions in dimen registers.

*Todo: This could/should perhaps be generalized to set height depth and width given an arbitrary box.*

190 `\cs\_new:Npn \_shipout\_get\_box\_size:N #1 {`  
 191 `\dim\_set:Nn \l\_shipout\_box\_ht\_dim { \box\_ht:N #1 }`  
 192 `\dim\_set:Nn \l\_shipout\_box\_dp\_dim { \box\_dp:N #1 }`  
 193 `\dim\_set:Nn \l\_shipout\_box\_wd\_dim { \box\_wd:N #1 }`  
 194 `\dim\_set:Nn \l\_shipout\_box\_ht\_plus\_dp\_dim`  
 195 `{ \l\_shipout\_box\_ht\_dim + \l\_shipout\_box\_dp\_dim }`  
 196 `}`

(End definition for `\_shipout\_get\_box\_size:N.`)

`\l\_shipout\_box\_ht\_dim` And here are the variables set by `\_shipout\_get\_box\_size:N`.

`\l\_shipout\_box\_dp\_dim` 197 `\dim\_new:N \l\_shipout\_box\_ht\_dim`

`\l\_shipout\_box\_wd\_dim` 198 `\dim\_new:N \l\_shipout\_box\_dp\_dim`

`\l\_shipout\_box\_ht\_plus\_dp\_dim` 199 `\dim\_new:N \l\_shipout\_box\_wd\_dim`

200 `\dim\_new:N \l\_shipout\_box\_ht\_plus\_dp\_dim`

(End definition for `\l\_shipout\_box\_ht\_dim` and others. These functions are documented on page 899.)

`\g\_shipout\_discard\_bool` Indicate whether or not the current page box should be discarded

201 `\bool\_new:N \g\_shipout\_discard\_bool`

(End definition for `\g\_shipout\_discard\_bool.`)

`\l\_shipout\_tmp\_box` We need a box for the background and foreground material and a token register to  
`\l\_shipout\_saved\_badness\_tl` remember badness settings as we disable them during the buildup below.

202 `\box\_new:N \l\_shipout\_tmp\_box`

203 `\tl\_new:N \l\_shipout\_saved\_badness\_tl`

(End definition for `\l__shipout_tmp_box` and `\l__shipout_saved_badness_tl`.)

`\__shipout_add_background_box:n` In standard L<sup>A</sup>T<sub>E</sub>X the shipout box is always a `\vbox` but here we are allow for other usage as well, in case some package has its own output routine.

```
204 \cs_new:Npn \__shipout_add_background_box:n #1
205 { \__shipout_get_box_size:N \l_shipout_box
```

But we start testing for a vertical box as that should be the normal case.

```
206 \box_if_vertical:NTF \l_shipout_box
207 {
```

Save current values of `\vfuzz` and `\vbadness` then change them to allow box manipulations without warnings.

```
208 \tl_set:Nx \l__shipout_saved_badness_tl
209 { \vfuzz=\the\vfuzz\relax
210 \vbadness=\the\vbadness\relax }
211 \vfuzz=\c_max_dim
212 \vbadness=\c_max_int
```

Then we reconstruct `\l_shipout_box` ...

```
213 \vbox_set_to_ht:Nnn \l_shipout_box \l_shipout_box_ht_plus_dp_dim
214 {
```

... the material in `#1` is placed into a horizontal box with zero dimensions.

```
215 \hbox_set:Nn \l__shipout_tmp_box
216 { \l__shipout_saved_badness_tl #1 }
217 \box_set_wd:Nn \l__shipout_tmp_box \c_zero_dim
218 \box_set_ht:Nn \l__shipout_tmp_box \c_zero_dim
219 \box_set_dp:Nn \l__shipout_tmp_box \c_zero_dim
```

The we typeset that box followed by whatever was in `\l_shipout_box` before (unpacked).

```
220 \skip_zero:N \baselineskip
221 \skip_zero:N \lineskip
222 \skip_zero:N \lineskiplimit
223 \box_use:N \l__shipout_tmp_box
224 \vbox_unpack:N \l_shipout_box
```

The `\kern` ensures that the box has no depth which is afterwards explicitly corrected.

```
225 \kern \c_zero_dim
226 }
227 \box_set_ht:Nn \l_shipout_box \l_shipout_box_ht_dim
228 \box_set_dp:Nn \l_shipout_box \l_shipout_box_dp_dim
```

*Todo: The whole boxing maneuver looks a bit like overkill to me, but for the moment I leave.*

```
229 \l__shipout_saved_badness_tl
230 }
231 {
```

A horizontal box is handled in a similar way. The last case would be a void box in which case we do nothing hence the missing F branch.

```
232 \box_if_horizontal:NT \l_shipout_box
233 {
234 \tl_set:Nx \l__shipout_saved_badness_tl
235 { \hfuzz=\the\hfuzz\relax
```

```

236         \hbadness=\the\hbadness\relax }
237     \hfuzz=\c_max_dim
238     \hbadness=\c_max_int
239     \hbox_set_to_wd:Nnn \l_shipout_box \l_shipout_box_wd_dim
240     {
241         \hbox_set:Nn \l__shipout_tmp_box
242         { \l__shipout_saved_badness_tl #1 }
243         \box_set_wd:Nn \l__shipout_tmp_box \c_zero_dim
244         \box_set_ht:Nn \l__shipout_tmp_box \c_zero_dim
245         \box_set_dp:Nn \l__shipout_tmp_box \c_zero_dim
246         \box_move_up:nn
247             \l_shipout_box_ht_dim
248         { \box_use:N \l__shipout_tmp_box }
249         \hbox_unpack:N \l_shipout_box
250     }
251     \l__shipout_saved_badness_tl
252 }
253 }
254 }

```

(End definition for \\_\_shipout\_add\_background\_box:n.)

\\_\_shipout\_add\_foreground\_box:n Foreground boxes are done in the same way, only the order and placement of boxes has to be done differently.

```

255 \cs_new:Npn \__shipout_add_foreground_box:n #1
256 {
257     \box_if_vertical:NTF \l_shipout_box
258     {
259         \tl_set:Nx \l__shipout_saved_badness_tl
260         { \vfuzz=\the\vfuzz\relax
261           \vbadness=\the\vbadness\relax }
262         \vfuzz=\c_max_dim
263         \vbadness=\c_max_int
264         \vbox_set_to_ht:Nnn \l_shipout_box \l_shipout_box_ht_plus_dp_dim
265         {
266             \hbox_set:Nn \l__shipout_tmp_box
267             { \l__shipout_saved_badness_tl #1 }
268             \box_set_wd:Nn \l__shipout_tmp_box \c_zero_dim
269             \box_set_ht:Nn \l__shipout_tmp_box \c_zero_dim
270             \box_set_dp:Nn \l__shipout_tmp_box \c_zero_dim
271             \skip_zero:N \baselineskip
272             \skip_zero:N \lineskip
273             \skip_zero:N \lineskiplimit
274             \vbox_unpack:N \l_shipout_box
275             \kern -\l_shipout_box_ht_plus_dp_dim
276             \box_use:N \l__shipout_tmp_box
277             \kern \l_shipout_box_ht_plus_dp_dim
278         }
279         \l__shipout_saved_badness_tl
280         \box_set_ht:Nn \l_shipout_box \l_shipout_box_ht_dim
281         \box_set_dp:Nn \l_shipout_box \l_shipout_box_dp_dim
282     }
283     {
284         \box_if_horizontal:NT \l_shipout_box

```

```

285     {
286       \tl_set:Nx \l__shipout_saved_badness_tl
287       { \hfuzz=\the\hfuzz\relax
288         \hbadness=\the\hbadness\relax }
289       \hfuzz=\c_max_dim
290       \hbadness=\c_max_int
291       \hbox_set_to_wd:Nnn \l_shipout_box \l_shipout_box_wd_dim
292       {
293         \hbox_unpack:N \l_shipout_box
294         \kern -\box_wd:N \l_shipout_box
295         \hbox_set:Nn \l__shipout_tmp_box
296         { \l__shipout_saved_badness_tl #1 }
297         \box_set_wd:Nn \l__shipout_tmp_box \c_zero_dim
298         \box_set_ht:Nn \l__shipout_tmp_box \c_zero_dim
299         \box_set_dp:Nn \l__shipout_tmp_box \c_zero_dim
300         \box_move_up:nn { \box_ht:N \l_shipout_box }
301         { \box_use:N \l__shipout_tmp_box }
302         \kern \box_wd:N \l_shipout_box
303       }%
304       \l__shipout_saved_badness_tl
305     }
306   }
307 }

```

(End definition for `\__shipout_add_foreground_box:n`.)

`\__shipout_init_page_origins:`  
`\c__shipout_horigin_tl`  
`\c__shipout_vorigin_tl`

Two constants holding the offset of the top-left with respect to the media box.

Setting the constants this way is courtesy of Bruno.

We delay setting the constants to the last possible place as there might be updates in the preamble or even in the `begindocument` hook that affects their setup.

```

308 \cs_new:Npn \__shipout_init_page_origins: {
309   \tl_const:Nx \c__shipout_horigin_tl
310   {
311     \cs_if_exist_use:NTF \pdfvariable { horigin }
312     { \cs_if_exist_use:NF \pdfhorigin { 1in } }
313   }
314   \tl_const:Nx \c__shipout_vorigin_tl
315   {
316     \cs_if_exist_use:NTF \pdfvariable { vorigin }
317     { \cs_if_exist_use:NF \pdfvorigin { 1in } }
318   }

```

After the constants have been set there is no need to execute this command again, in fact it would raise an error, so we redefine it to do nothing.

```

319   \cs_gset_eq:NN \__shipout_init_page_origins: \prg_do_nothing:
320 }

```

(End definition for `\__shipout_init_page_origins:`, `\c__shipout_horigin_tl`, and `\c__shipout_vorigin_tl`.)

`\__shipout_picture_overlay:n`

Put the argument into a `picture` environment that doesn't take up any size and uses 1pt for `\unitlength`.

*Todo: Could perhaps be generalized as it might be useful elsewhere. For now it is not.*

```
321 \cs_new:Npn \__shipout_picture_overlay:n #1 {
```

The very first time this is executed we have to initialize (and freeze) the origins.

```
322   \__shipout_init_page_origins:
323   \kern -\c__shipout_horigin_tl \scan_stop:
324   \vbox_to_zero:n {
325     \kern -\c__shipout_vorigin_tl \scan_stop:
326     \unitlength 1pt \scan_stop:
```

This mimics a simple zero-sized picture environment. The `\hss` is need in case there is horizontal material (without using `\put` with a positive width.

```
327     \hbox_set_to_wd:Nnn \l__shipout_tmp_box \c_zero_dim
328     { \ignorespaces #1 \hss }
329     \box_set_ht:Nn \l__shipout_tmp_box \c_zero_dim
330     \box_set_dp:Nn \l__shipout_tmp_box \c_zero_dim
331     \box_use:N \l__shipout_tmp_box
332     \tex_vss:D
333   }
334 }
```

*(End definition for `\__shipout_picture_overlay:n`.)*

`\__shipout_add_background_picture:n`

Put a `picture` env in the background of the shipout box with its reference point in the top-left corner.

```
335 \cs_new:Npn \__shipout_add_background_picture:n #1 {
336   \__shipout_add_background_box:n { \__shipout_picture_overlay:n {#1} }
337 }
```

*(End definition for `\__shipout_add_background_picture:n`.)*

`\__shipout_add_foreground_picture:n`

Put a `picture` env in the foreground of the shipout box with its reference point in the top-left corner.

```
338 \cs_new:Npn \__shipout_add_foreground_picture:n #1 {
339   \__shipout_add_foreground_box:n { \__shipout_picture_overlay:n {#1} }
340 }
```

*(End definition for `\__shipout_add_foreground_picture:n`.)*

**`\shipout_discard:`**

Request that the next shipout box should be discarded. At the moment this is just setting a boolean, but we may want to augment this behavior that the position of the call is taken into account (in case  $\text{\LaTeX}$  looks ahead and is not using the position for on the next page).

```
341 \cs_new_protected:Npn \shipout_discard: {
342   \bool_gset_true:N \g__shipout_discard_bool
343 }
```

*(End definition for `\shipout_discard:`. This function is documented on page 901.)*

## 3.2 Handling the end of job hook

At the moment this is partly solved by using the existing hooks. But rather than putting the code into these hooks it should be moved to the right place directly as we shouldn't prefill hooks with material unless it needs to interact with other code.

```
\g_shipout_readonly_int \ReadonlyShipoutCounter
```

We count every shipout activity that makes a page (but not those that are discarded) in order to know how many pages got produced.

```
344 \int_new:N \g_shipout_readonly_int
```

For L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> it is available as a command (i.e., a T<sub>E</sub>X counter only).

```
345 \cs_new_eq:NN \ReadonlyShipoutCounter \g_shipout_readonly_int
```

*(End definition for \g\_shipout\_readonly\_int and \ReadonlyShipoutCounter. These functions are documented on page 902.)*

```
\g_shipout_totalpages_int \c@totalpages
```

We count every shipout attempt (even those that are discarded) in this counter. It is not used in the code but may get used in user code.

```
346 \int_new:N \g_shipout_totalpages_int
```

For L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> this is offered as a L<sup>A</sup>T<sub>E</sub>X counter so can be easily typeset inside the output routine to display things like “\thepage/\thetotalpages”, etc.

```
347 \cs_new_eq:NN \c@totalpages \g_shipout_totalpages_int
348 \cs_new:Npn \thetotalpages { \arabic{totalpages} }
```

*(End definition for \g\_shipout\_totalpages\_int and \c@totalpages. These functions are documented on page 902.)*

```
\@abspage@last
```

In \@abspage@last record the number of pages from the last run. This is written to the .aux and this way made available to the next run. In case there is no .aux file or the statement is missing from it we initialize it with the largest possible number in T<sub>E</sub>X. We use this as the default because then we are inserting the shipout/lastpage on the last page (or after the last page) but not on page 1 for a multipage document.

```
349 \xdef\@abspage@last{\number\maxdimen}
```

*(End definition for \@abspage@last.)*

```
\enddocument
```

Instead of using the hooks enddocument and enddocument/afterlastpage we add this code to private kernel hooks to be 100% sure when it is executed and to avoid cluttering the hooks with data that is always there.

Inside \enddocument there is a \clearpage. Just before that we execute this code here. There is a good chance that we are on the last page. Therefore, if we don't know the value from the last run, we assume that the current page is the right one. So we set \@abspage@last and as a result the next shipout will run the shipout/lastpage code. Of course, if there are floats that still need a placement this guess will be wrong but then rerunning the document will give us the correct value next time around.

```
\@kernel@after@enddocument 350 \g@addto@macro \@kernel@after@enddocument {
351 \int_compare:nNnT \@abspage@last = \maxdimen
352 {
We use LATEX 2ε coding as \@abspage@last is not an L3 name.
353 \xdef\@abspage@last{ \int_eval:n {\g_shipout_readonly_int + 1} }
354 }
355 }
```

\@kernel@after@enddocument@afterlastpage

Once the `\clearpage` has done its work inside `\enddocument` we know for sure how many pages this document has, so we record that in the `.aux` file for the next run.

```
356 \g@addto@macro \@kernel@after@enddocument@afterlastpage {
```

There is one special case: If no output is produced then there is no point in a) recording the number as 0 will never match the page number of a real page and b) adding an extra page to run the `shipout/lastpage` is pointless as well (as it would remain forever). So we test for this and run the code only if there have been pages.

```
357   \int_compare:nNf \g_shipout_readonly_int = 0
358   {
```

This ends up in the `.aux` so we use L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> names here.

*Todo: This needs an interface for `\nofiles` in `expl3`, doesn't at the moment!*

```
359   \if@filesw
360     \iow_now:Nx \@auxout {
361       \gdef\string\@abspage@last {\int_use:N \g_shipout_readonly_int}}
362   \fi
```

But we may have guessed wrongly earlier and have run it too early or we still have to run the `shipout/lastpage` even though there is no page to place it into. If that is the case we make a trivial extra page and put it there. This temporary page will then vanish again on the next run but helps to keep pdf viewers happy. In either case we should put out an appropriate “rerun” warning.

```
363   \bool_if:NTF \g__shipout_lastpage_handled_bool
364   {
```

If the hook was already executed, we have to test if that total shipouts match the shipouts from last run (because that corresponds to the page it was executed). If not we output a warning.

```
365       \int_compare:nNf \@abspage@last = \g_shipout_readonly_int
366       {
367         \@latex@warning@no@line{Hook~ 'shipout/lastpage'~ executed~
368         on~ wrong~ page~ (\@abspage@last\space not~
369         \int_use:N \g_shipout_readonly_int).\MessageBreak
370         Rerun~ to~ correct~ this}%
371       }
372     }
373     {
```

If the hook was not run, we need to add an extra page and place it there. However, making this extra page in case the hook is actually empty would be forcing a rerun without any reason, so we check that condition and also check if `\@kernel@after@shipout@lastpage` contains any code. If both are empty we omit the page generation.

```
374       \bool_lazy_and:nnF
375       { \hook_if_empty_p:n {shipout/lastpage} }
376       { \tl_if_empty_p:N \@kernel@after@shipout@lastpage }
377       {
378         \tex_shipout:D\ vbox to\textheight
379         {
380           \hbox:n { \UseHook{shipout/lastpage}
381                     \@kernel@after@shipout@lastpage }
382         }
383       }
```

This extra page could be totally empty except for the hook content, but to help the user understanding why it is there we put some text into it.

```

382             \_shipout_excuse_extra_page:
383             \null
384         }

```

At this point we also signal to L<sup>A</sup>T<sub>E</sub>X's endgame that a rerun is necessary so that an appropriate message can be shown on the terminal. We do this by simply defining a command used as a flag and tested in `\enddocument`.

```

385             \cs_gset_eq:NN \@extra@page@added \relax
386         }
387     }
388 }
389 }

```

*(End definition for \enddocument, \@kernel@after@enddocument, and  
\@kernel@after@enddocument@afterlastpage.)*

`\_shipout_excuse_extra_page:` Say mea culpa ...

```

390 \cs_new:Npn \_shipout_excuse_extra_page: {
391     \vfil
392     \begin{center}
393         \bfseries Temporary~ page!
394     \end{center}
395     \LaTeX{}~ was~ unable~ to~ guess~ the~ total~ number~ of~ pages~
396     correctly.~ ~ As~ there~ was~ some~ unprocessed~ data~ that~
397     should~ have~ been~ added~ to~ the~ final~ page~ this~ extra~
398     page~ has~ been~ added~ to~ receive~ it.
399     \par
400     If~ you~ rerun~ the~ document~ (without~ altering~ it)~ this~
401     surplus~ page~ will~ go~ away,~ because~ \LaTeX{}~ now~ knows~
402     how~ many~ pages~ to~ expect~ for~ this~ document.
403     \vfil
404 }

```

*(End definition for \\_shipout\_excuse\_extra\_page:.)*

**\PreviousTotalPages** In the preamble before the aux file was read `\PreviousTotalPages` is always zero.

`\@kernel@before@begindocument` 405 `\def\PreviousTotalPages{0}`

In the aux file there should be an update for `\@abspage@last` recording the number of pages from the previous run. If not that macro holds the value of `\maxdimen`. So we test for it and update `\PreviousTotalPages` if there was a real value. This should happen just before the `begindocument` hook is executed so that the value can be used inside that hook.

```

406 \g@addto@macro\@kernel@before@begindocument
407     {\ifnum\@abspage@last<\maxdimen
408         \xdef\PreviousTotalPages{\@abspage@last}\fi}

```

*(End definition for \PreviousTotalPages and \@kernel@before@begindocument. These functions are documented on page 902.)*



## 4 Legacy L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> interfaces

**\DiscardShipoutBox** Request that the next shipout box is to be discarded.

```

409 \cs_new_eq:NN \DiscardShipoutBox \shipout_discard:

```

(End definition for \DiscardShipoutBox. This function is documented on page 901.)

**\AtBeginDvi** If we roll forward from an earlier kernel \AtBeginDvi is defined so we better not use \cs\_new\_protected:Npn here.

```

410 \cs_set_protected:Npn \AtBeginDvi
411      { \__shipout_add_firstpage_material:Nn \AtBeginDvi }

```

(End definition for \AtBeginDvi. This function is documented on page 901.)

**\DebugShipoutsOn**  
**\DebugShipoutsOff**

```

412 \cs_new_eq:NN \DebugShipoutsOn \shipout_debug_on:
413 \cs_new_eq:NN \DebugShipoutsOff \shipout_debug_off:

```

(End definition for \DebugShipoutsOn and \DebugShipoutsOff. These functions are documented on page 903.)

## 5 Internal commands needed elsewhere

These internal commands use double and triple @ signs so we need to stop getting them translated to the module name.

```

414 <@@=>

```

Some internals needed elsewhere.

```

\expl@@@shipout@add@firstpage@material@@Nn
\expl@@@shipout@add@background@box@@n
\expl@@@shipout@add@foreground@box@@n
\expl@@@shipout@add@background@picture@@n
\expl@@@shipout@add@foreground@picture@@n
415 \cs_set_eq:NN \expl@@@shipout@add@firstpage@material@@Nn
416      \__shipout_add_firstpage_material:Nn
417 \cs_set_eq:NN \expl@@@shipout@add@background@box@@n
418      \__shipout_add_background_box:n
419 \cs_set_eq:NN \expl@@@shipout@add@foreground@box@@n
420      \__shipout_add_foreground_box:n
421 \cs_set_eq:NN \expl@@@shipout@add@background@picture@@n
422      \__shipout_add_background_picture:n
423 \cs_set_eq:NN \expl@@@shipout@add@foreground@picture@@n
424      \__shipout_add_foreground_picture:n

```

(End definition for \expl@@@shipout@add@firstpage@material@@Nn and others.)

```

425 \ExplSyntaxOff
426 </2ekernel | latexrelease>
427 <latexrelease>\EndIncludeInRelease

```

Rolling back here doesn't undefine the interface commands as they may be used in packages without rollback functionality. So we just make them do nothing which may or may not work depending on the code usage.

```

428 <latexrelease>\IncludeInRelease{0000/00/00}%
429 <latexrelease>      {\shipout}{Hook management (shipout)}%
430 <latexrelease>

```

If we roll forward then `\tex_shipout:D` may not be defined in which case `\shipout` does have it original definition and so we must not `\let` it to something else which is `\relax`!

```

431 <latexrelease>\ifcename tex_shipout:D\endcsname
432 <latexrelease>\expandafter\let\expandafter\shipout
433 <latexrelease>\csname tex_shipout:D\endcsname
434 <latexrelease>\fi
435 <latexrelease>
436 <latexrelease>\let \RawShipout\@undefined
437 <latexrelease>\let \ShipoutBox\@undefined
438 <latexrelease>\let \ReadonlyShipoutCounter \@undefined
439 <latexrelease>\let \c@totalpages \@undefined
440 <latexrelease>\let \thetotalpages \@undefined
441 <latexrelease>
442 <latexrelease>\let \DiscardShipoutBox \@undefined
443 <latexrelease>\let \DebugShipoutsOn \@undefined
444 <latexrelease>\let \DebugShipoutsOff \@undefined
445 <latexrelease>
446 <latexrelease>\DeclareRobustCommand \AtBeginDvi [1]{%
447 <latexrelease> \global \setbox \@begindvibox
448 <latexrelease> \vbox{\unvbox \@begindvibox #1}%
449 <latexrelease>}
450 <latexrelease>
451 <latexrelease>\let \AtBeginShipout \@undefined
452 <latexrelease>\let \AtBeginShipoutNext \@undefined
453 <latexrelease>
454 <latexrelease>\let \AtBeginShipoutFirst \@undefined
455 <latexrelease>
456 <latexrelease>\let \ShipoutBoxHeight \@undefined
457 <latexrelease>\let \ShipoutBoxDepth \@undefined
458 <latexrelease>\let \ShipoutBoxWidth \@undefined
459 <latexrelease>

```

We do not undo a substitution when rolling back. As the file support gets undone the underlying data is no longer used (and sufficiently obscure that it should not interfere with existing commands) and properly removing it would mean we need to make the `\undeclare@...` and its support macros available in all earlier kernel releases which is pointless (and actually worse).

```

460 <latexrelease>
461 <latexrelease>\let \AtEndDvi \@undefined

```

We do not reenale a disabled package load when rolling back. As the file support gets undone the underlying data is no longer checked (and sufficiently obscure that it should not interfere with existing commands) and properly removing it would mean we need to make the `\reenable@package@load` command available in all earlier kernel releases which is pointless (and actually worse).

```

462 %\reenable@package@load{atenddvi}
463 <latexrelease>
464 <latexrelease>\EndIncludeInRelease
465 <*2kernel>

```

## 6 Package emulation for compatibility

### 6.1 Package `atenddvi` emulation

`\AtEndDvi` This package has only one public command, so simulating it is easy and actually sensible to provide as part of the kernel.

```
466 </2ekernel>
467 <*2ekernel | latexrelease>
468 <latexrelease>\IncludeInRelease{2020/10/01}%
469 <latexrelease>          {\AtEndDvi}{atenddvi emulation}%
470 \ExplSyntaxOn
471 \cs_new_protected:Npn \AtEndDvi #1 {\AddToHook{shipout/lastpage}{#1}}
472 \ExplSyntaxOff
```

As the package is integrate we prevent loading (no need to roll that back):

```
473 \disable@package@load{atenddvi}
474   {\PackageWarning{atenddvi}
475     {Functionality of this package is already\MessageBreak
476       provided by LaTeX.\MessageBreak\MessageBreak
477       It is there no longer necessary to load it\MessageBreak
478       and you can safely remove it.\MessageBreak
479       Found on}}
480 </2ekernel | latexrelease>
481 <latexrelease>\EndIncludeInRelease
482 <latexrelease>\IncludeInRelease{0000/00/00}%
483 <latexrelease>          {\AtEndDvi}{atenddvi emulation}%
484 <latexrelease>\let \AtEndDvi \@undefined
485 <latexrelease>\EndIncludeInRelease
486 <*2ekernel>
```

(End definition for `\AtEndDvi`. This function is documented on page 901.)

```
487 </2ekernel>
```

### 6.2 Package `atbegshi` emulation

```
488 <*atbegshi-ltx>
489 \ProvidesPackage{atbegshi-ltx}
490   [2021/01/10 v1.0c
491     Emulation of the original atbegshi^^Jpackage with kernel methods]
```

`\AtBeginShipoutBox`

```
492 \let \AtBeginShipoutBox \ShipoutBox
```

(End definition for `\AtBeginShipoutBox`. This function is documented on page 903.)

`\AtBeginShipoutInit` Compatibility only, we aren't delaying ...

```
493 \let \AtBeginShipoutInit \@empty
```

(End definition for `\AtBeginShipoutInit`. This function is documented on page 904.)

`\AtBeginShipout` Filling hooks

```
\AtBeginShipoutNext 494 \protected\long\def\AtBeginShipout      #1{\AddToHook{shipout/before}{#1}}
495 \protected\long\def\AtBeginShipoutNext  #1{\AddToHookNext{shipout/before}{#1}}
```

(End definition for `\AtBeginShipout` and `\AtBeginShipoutNext`. These functions are documented on page 904.)

`\AtBeginShipoutFirst` Slightly more complex as we need to know the name of the command under which the shipout/firstpage hook is filled.

```
496 \protected \def \AtBeginShipoutFirst
497   {\@expl@@@shipout@add@firstpage@material@@Nn \AtBeginShipoutFirst}
```

(End definition for `\AtBeginShipoutFirst`. This function is documented on page 904.)

`\AtBeginShipoutDiscard` Just a different name.

```
498 \let \AtBeginShipoutDiscard \DiscardShipoutBox
```

(End definition for `\AtBeginShipoutDiscard`. This function is documented on page 904.)

`\AtBeginShipoutAddToBox` We don't expose them.

```
\AtBeginShipoutAddToBoxForeground 499 \let \AtBeginShipoutAddToBox
\AtBeginShipoutUpperLeft           \@expl@@@shipout@add@background@box@@n
\AtBeginShipoutUpperLeftForeground 500 \let \AtBeginShipoutAddToBoxForeground
                                     \@expl@@@shipout@add@foreground@box@@n
501 \let \AtBeginShipoutAddToBoxForeground
502 \let \AtBeginShipoutUpperLeft
503 \let \AtBeginShipoutUpperLeft
504 \let \AtBeginShipoutUpperLeftForeground
505 \let \AtBeginShipoutUpperLeftForeground
506 \let \AtBeginShipoutUpperLeftForeground
    \@expl@@@shipout@add@foreground@picture@@n
```

(End definition for `\AtBeginShipoutAddToBox` and others. These functions are documented on page 903.)

`\AtBeginShipoutOriginalShipout` This offers the raw `\shipout` primitive of the engine. A page shipped out with this is not counted by `\ReadonlyShipoutCounter` counter and thus the mechanism to place `\specials` at the very end of the output might fail, etc. It should therefore not be used in new applications but is only provided to allow running legacy code. For new code use the commands provided by the kernel instead.

```
507 \ExplSyntaxOn
508 \cs_new_eq:NN \AtBeginShipoutOriginalShipout \tex_shipout:D
```

(End definition for `\AtBeginShipoutOriginalShipout`. This function is documented on page 904.)

`\ShipoutBoxHeight` This is somewhat different from the original in `atbegshi` where `\ShipoutBoxHeight` etc. only holds the `\the\ht<box>` value. This may have some implications in some use cases and if that is a problem then it might need changing.

```
509 \cs_new:Npn \ShipoutBoxHeight { \dim_use:N \l_shipout_box_ht_dim }
510 \cs_new:Npn \ShipoutBoxDepth  { \dim_use:N \l_shipout_box_dp_dim }
511 \cs_new:Npn \ShipoutBoxWidth  { \dim_use:N \l_shipout_box_wd_dim }
512 \ExplSyntaxOff
```

(End definition for `\ShipoutBoxHeight`, `\ShipoutBoxWidth`, and `\ShipoutBoxDepth`.)

```
513 </atbegshi-ltx>
```

If the package is requested we substitute the one above:

```
514 <*2ekernel>
515 \declare@file@substitution{atbegshi.sty}{atbegshi-ltx.sty}
516 </2ekernel>
```

### 6.3 Package **everyshi** emulation

This is now directly handled in that package so emulation is not necessary any more.

Rather important :-)

517  $\langle @@= \rangle$

# File Y

## ltoutput.dtx

### 1 Output Routine

#### 1.1 Floats

The ‘2ekernel’ code ensures that a `\usepackage{autoout1}` is essentially ignored if a ‘full’ format is being used that has the autoloader file mode already in the format.

```

1 <def>\beginingroup
2 <def>\makeatletter
3 <def>\nfss@catcodes
4 <2ekernel>\expandafter\let\csname ver@autoout1.sty\endcsname\fmtversion

```

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

```

5 <*2ekernel>
6 \message{output,}

*****
*                               *
*                               *
*****

```

#### PAGE LAYOUT PARAMETERS

```

\topmargin      : Extra space added to top of page.
@twoside        : boolean.  T if two-sided printing
\oddsidemargin  : IF @twoside = T
                  THEN extra space added to left of odd-numbered
                  pages.
                  ELSE extra space added to left of all pages.
\evensidemargin : IF @twoside = T
                  THEN extra space added to left of even-numbered
                  pages.

\headheight     : height of head
\headsep        : separation between head and text
\footskip       : distance separation between baseline of last
                  line of text and baseline of foot.
                  Note difference between \footSKIP and \headSEP.
\textheight     : height of text on page, excluding head and foot
\textwidth      : width of printing on page
\columnsep      : IF @twocolumn = T
                  THEN width of space between columns
\columnseprule  : IF @twocolumn = T
                  THEN width of rule between columns (0 if none).
\columnwidth    : IF @twocolumn = T
                  THEN (\textwidth - \columnsep)/2
                  ELSE \textwidth
                  It is set by the \twocolumn and
                  \onecolumn commands.

```

`\@textbottom` : Command executed at bottom of vbox holding text of page (including figures). The `\raggedbottom` command almost `\let's` this to `\vfil` (actually sets it to `\vskip \z@ plus.0001fil`). Should have depth 0pt.

`\@texttop` : Command executed at top of vbox holding text of page (including figures). Used by letter style; can also be used to produce centered pages. Let to `\relax` by `\raggedbottom` and `\flushbottom`.

Page layout must initialize `\@colht` and `\@colroom` to `\textheight`.

#### PAGE STYLE PARAMETERS:

`\floatsep` : Space left between floats.

`\textfloatsep` : Space between last top float or first bottom float and the text.

`\topfigrule` : Command to place rule (or whatever) between floats at top of page and text. Executed in inner vertical mode right before the `\textfloatsep` skip separating the floats from the text. Must occupy zero vertical space. (See `\footnoterule`.)

`\botfigrule` : Same as `\topfigrule`, but put after the `\textfloatsep` skip separating text from the floats at bottom of page.

`\intextsep` : Space left on top and bottom of an in-text float.

`\dblfloatsep` : Space between double-column floats.

`\dbltextfloatsep` : Space between top double-column floats and text.

`\dblfigrule` : Similar to `\topfigrule`, but for double-column floats.

`\@fptop` : Glue to go at top of float column – must be 0pt + stretch

`\@fpsep` : Glue to go between floats in a float column.

`\@fpbot` : Glue to go at bottom of float column  
– must be 0pt + stretch

`\@dblfpsep`, `\@dblfpbot` : Analogous for double-column float page in two-column format.

FOOTNOTES: As in PLAIN, footnotes use `\insert\footins`.

#### PAGE LAYOUT SWITCHES AND MACROS

`@twocolumn` : Boolean. T if two columns per page globally.

#### PAGE STYLE MACROS AND SWITCHES

```

\@oddhead      : IF @twoside = T
                  THEN macro to generate head of odd-numbered
                  pages.
                  ELSE macro to generate head of all pages.
\@evenhead     : IF @twoside = T
                  THEN macro to generate head of even-numbered
                  pages.
\@oddfoot      : IF @twoside = T
                  THEN macro to generate foot of odd-numbered
                  pages.
                  ELSE macro to generate foot of all pages.
\@evenfoot     : IF @twoside = T
                  THEN macro to generate foot of even-numbered
                  pages.
@specialpage   : boolean. T if current page is to have a special
                  format.
\@specialstyle : If its value is foo then
                  IF @specialpage = T
                  THEN the command \ps@foo is executed to
                  temporarily reset the page style parameters
                  before composing the current page.
                  This command should execute only \def's and
                  \edef's, making only local definitions.

```

## FLOAT PLACEMENT PARAMETERS

The following parameters are set by the macro `\@floatplacement`.  
When `\@floatplacement` is called,

`\@colht` is the height of the page or column being built. I.e.:

- \* For single-column page it equals `\textheight`.
- \* For double-column page it equals `\textheight - height`  
of double-column floats on page.

Note that some are set globally and some locally:

```

\@topnum      :=G Maximum number of floats allowed on the top of a
                  column.
\@toproom     :=G Maximum amount of top of column devoted to floats—
                  excluding \textfloatsep separation below the floats
                  and \floatsep separation between them. For
                  two-column output, should be computed as a function
                  of \@colht.
\@botnum, \@botroom
              : Analogous to above.
\@colnum      :=G Maximum number of floats allowed in a column,
                  including in-text floats.
\@textmin     :=L Minimum amount of text (excluding footnotes) that
                  must appear on a text page.
                %% 27 Sep 85 : made local to
                %% \@addtocurcol and \@addtonextcol
                It is now also used locally in processing double
                floats.

```



`\@fpmin` :=L Minimum height of floats in a float column.

The macro `\@dblfloatplacement` sets the following parameters.

`\@dbltopnum` :=G Maximum number of double-column floats allowed at the top of a two-column page.

`\@dbltoproom` :=G Maximum height of double-column floats allowed at top of two-column page.

`\@fpmin` :=L Minimum height of floats in a float column.

It should also perform the following local assignments where necessary – i.e., where the new value differs from the old one:

`\@fptop` :=L `\@dblfpptop`

`\@fpsep` :=L `\@dblfpsep`

`\@fpbot` :=L `\@dblfpbot`

## OUTPUT ROUTINE VARIABLES

`\@colht` : The total height of the current column. In single column style, it equals `\textheight`. In two-column style, it is `\textheight` minus the height of the double-column floats on the current page. MUST BE INITIALIZED TO `\textheight`.

`\@colroom` : The height available in the current column for text and footnotes. It equals `\@colht` minus the height of all floats committed to the top and bottom of the current column.

`\@textfloatsheight` : The total height of in-text floats on the current page.

`\footins` : Footnote insertion number.

`\@maxdepth` : Saved value of TeX's `\maxdepth`. Must be set when any routine sets `\maxdepth`.

## CALLING THE OUTPUT ROUTINE

The output routine is called either by TeX's normal page-breaking mechanism, or by a macro putting a penalty  $<$  or  $= -10000$  in the output list. In the latter case, the penalty indicates why the output routine was called, using the following code.

penalty	reason
-10000	<code>\pagebreak</code> <code>\newpage</code>
-10001	<code>\clearpage</code> ( <code>\penalty -10000 \vbox{}</code> <code>\penalty -10001</code> )
-10002	float insertion, called from horizontal mode
-10003	float insertion, called from vertical mode.
-10004	float insertion.

Note: A float or marginpar puts the following sequence in the output list:

- (i) a penalty of -10004,
- (ii) a null `\vbox`
- (iii) a penalty of -10002 or -10003.

This solves two special problems:

1. If the float comes right after a `\newpage` or `\clearpage`, then the first penalty is ignored, but the second one invokes the output routine.
2. If there is a split footnote on the page, the second 'page' puts out the rest of the footnote.

## THE OUTPUT ROUTINE

---

### FUNCTIONS USED IN THE OUTPUT ROUTINE:

`\@outputpage` : Produces an output page with the contents of box `\@outputbox` as the text part.

Also sets `\@colht :=G \textheight`.

The page style is determined as follows.

IF `@thispagestyle = true`

THEN use `\thispagestyle` style

ELSE use ordinary page style.

`\@tryfcolumn\FLIST` : Tries to form a float column composed of floats from `\FLIST` (if nonempty) with the following parameters:

`\@colht` : height of box

`\@fpmin` : minimum height of floats in the box

`\@fpsep` : interfloat space

`\@fptop` : glue at top of box

`\@fpbot` : glue at bottom of box.

If it succeeds, then it does the following:

\* `\@outputbox :=L` the composed float box.

\* `@fcolmade :=G true`

\* `\FLIST :=G \FLIST` - floats put in box

\* `\@freelist :=G \@freelist +` floats put in box

If it fails, then:

\* `@fcolmade :=G false`

NOTE: BIT MUST BE A SINGLE TOKEN!

`\@makefcolumn \FLIST` : Same as `\@tryfcolumn` except that it fails to make a float column only if `\FLIST` is empty. Otherwise, it makes a float column containing at least the first box in `\FLIST`, disregarding `\@fpmin`.

`\@startcolumn` :

Calls `\@tryfcolumn\@deferlist`. If `\@tryfcolumn` returns with (globally set) `@fcolmade = false`, then:

\* Globally sets `\@toplist` and `\@botlist` to floats

from `\@deferlist` to go at top and bottom of column, deleting them from `\@deferlist`. It does this using `\@colht` as the total height, the page style parameters `\@floatsep` and `\@textfloatsep`, and the float placement parameters `\@topnum`, `\@toproom`, `\@botnum`, `\@botroom`, `\@colnum` and `\textfraction`.

- \* Globally sets `\@colroom` to `\@colht` minus the height of the added floats.

`\@startdblcolumn` :

Calls `\@tryfcolumn\@dbldeferlist{8}`. If `\@tryfcolumn` returns with (globally set) `@fcolmade = false`, then:

- \* Globally sets `\@dbltoplist` to floats from `\@dbldeferlist` to go at top and bottom of column, deleting them from `\@dbldeferlist`. It does this using `\textheight` as the total height, and the parameters `\@dblfloatsep`, etc.
- \* Globally sets `\@colht` to `\textheight` minus the height of the added floats.

`\@combinefloats` : Combines the text from box

`\@outputbox` with the floats from `\@toplist` and `\@botlist`, putting the new box in `\@outputbox`. It uses `\floatsep` and `\textfloatsep` for the appropriate separations. It puts the elements of `\@TOPLIST` and `\@BOTLIST` onto `\@freelist`, and makes those lists null.

`\@makecol` : Makes the contents of `\box255` plus the accumulated footnotes, plus the floats in `\@toplist` and `\@botlist`, into a single column of height `\@colht` (unless the page height has been locally changed), which it puts into box `\@outputbox`. It puts boxes in `\@midlist` back onto `\@freelist` and restores `\maxdepth`.

`\@opcol` : Outputs a column whose text is in box `\@outputbox`

If `@twocolumn = false`, then it calls `\@outputpage`, sets `\@colht :=G \textheight`, and calls `\@floatplacement`.

If `@twocolumn = true`, then:

If `@firstcolumn = true`, then it puts box `\@outputbox` into `\@leftcolumn` and sets `@firstcolumn :=G false`.

If `@firstcolumn = false`, then it puts out the current two-column page, any possible two-column float pages, and determines `\@dbltoplist` for the next page.

## USER COMMANDS THAT CALL OR AFFECT THE OUTPUT ROUTINE

---

```

\newpage == BEGIN \par\vfil\penalty -10000 END

\clearpage == BEGIN \newpage
                \write -1{}      % Part of hack to make sure no
                \vbox{}          % \write's get lost.
                \penalty -10001
            END

\cleardoublepage == BEGIN \clearpage
                        if @twoside = true and c@page is even
                        then \hbox{} \newpage fi
            END

\twocolumn[BOX] : starts a new page, changing to twocolumn setting
and puts BOX in a parbox of width \textwidth across the top.
Useful for full-width titles for double-column pages.
SURPRISE: The stretch from \@dbltextfloatsep will be inserted
between the BOX and the top of the two columns.

```

## FLOAT-HANDLING MECHANISMS

---

The float environment obtains an insertion number B from the `\@freelist` (see below for a description of list manipulation), puts the float into box B and sets `\count B` to a FLOAT SPECIFIER. For a normal (not double-column) float, it then causes a page break in one of the following two ways:

- In outer hmode: `\vadjust{\penalty -10002}`
- In vmode : `\penalty -10003`.

For a double-column float, it puts B onto the `\@dbldeferlist`.

The float specifier has two components:

- \* A PLACEMENT SPECIFICATION, describing where the float may be placed.
- \* A TYPE, which is a power of two—e.g., figures might be type 1 floats, tables type 2 floats, programs type 4 floats, etc.

The float specifier is encoded as follows, where bit 0 is the least significant bit.

Bit	Meaning
0	1 iff the float may go where it appears in the text.
1	1 iff the float may go on the top of a page.
2	1 iff the float may go on the bottom of a page.
3	1 iff the float may go on a float page.
4	1 unless the PLACEMENT includes a !
5	1 iff a type 1 float

6      1 iff a type 2 float  
etc.

A negative float specifier is used to indicate a marginal note.

## MACROS AND DATA STRUCTURES FOR PROCESSING FLOATS

---

A FLOAT LIST consisting of the floats in boxes `\boxa ... \boxN` has the form:

```
\@elt \boxa ... \@elt \boxN
where \boxI is defined by
\newinsert\boxI
```

Normally, `\@elt` is `\let` to `\relax`. A test can be performed on the entire float list by locally `\def`'ing `\@elt` appropriately and executing the list.

This is a lot more efficient than looping through the list.

The following macros are used for manipulating float lists.

```
\@next \CS \LIST {NONEMPTY}{EMPTY} == %% NOTE: ASSUME \@elt
= \relax
  BEGIN  assume that \LIST == \@elt \B1 ... \@elt \Bn
        if n = 0
        then  EMPTY
        else  \CS      :=L \B1
              \LIST :=G \@elt \B2 ... \@elt \Bn
              NONEMPTY
        fi
  END
```

`\@bitor\NUM\LIST` : Globally sets switch `@test` to the disjunction for all `I` of bit `log2 \NUM` of the float specifiers of all the floats in `\LIST`.  
I.e., `@test` is set to true iff there is at least one float in `\LIST` having bit `log2 \NUM` of its float specifier equal to 1.

Note: `log2 [(\count I)/32]` is the bit number corresponding to the type of float `I`. To see if there is any float in `\LIST` having the same type as float `I`, you run `\@bitor` with  
`\NUM = [(\count I)/32] * 32`.

```
\@bitor\NUM\LIST ==
BEGIN
  @test :=G false
  { \@elt \CTR == if \NUM <> 0 then
                    if \count\CTR / \NUM is odd
                    then  @test := true          fi fi
```

```

\LIST
}
END

```

`\@cons\LIST\NUM` : Globally sets `\LIST := \LIST * \@elt \NUM`

```

\@cons\LIST\NUM ==
  BEGIN { \@elt == \relax
    \LIST :=G \LIST \@elt \NUM
  }

```

#### BOX LISTS FOR FLOAT-PLACEMENT ALGORITHMS

```

\@freelist      : List of empty boxes for placing new floats.
\@toplist       : List of floats to go at top of current column.
\@midlist       : List of floats in middle of current column.
\@botlist       : List of floats to go at bottom of current column.
\@deferlist     : List of floats to go after current column.
\@dbltoplist    : List of double-col. floats to go at top of current
                  page.
\@dbldeferlist  : List of double-column floats to go on subsequent
                  pages.

```

#### FLOAT-PLACEMENT ALGORITHMS

```

\@addtobot : Tries to put insert \@currbox on \@botlist.
             Called only when:
               * \ht BOX < \@colroom
               * type of \@currbox not on \@deferlist
               * \@colnum > 0
               * @insert = false
             If it succeeds, then:
               * sets @insert true
               * decrements \@botroom by \ht BOX
               * decrements \@botnum and \@colnum by 1
               * decrements \@colroom by \ht BOX + either \floatsep
                 or \textfloatsep, as appropriate.
               * sets \maxdepth to 0pt

\@addtotoporbot : Tries to put insert \@currbox on \@toplist or
                  \@botlist.
                  Called only under same conditions as \@addtobot.
                  If it succeeds, then:
                    * sets @insert true
                    * decrements \@toproom or \@botroom by \ht BOX
                    * decrements \@colnum and either \@topnum or
                      \@botnum by 1
                    * decrements \@colroom by \ht BOX + \floatsep

```

or `\textfloatsep`, as appropriate.

`\@addtocurcol` : Tries to add `\@currbox` to current column, setting  
`@insert` true if it succeeds, false otherwise.  
It will add `\@currbox` to top only if bit 0 of  
`\count \@currbox` is 0, and to the bottom only if  
bit 0 = 0 or an earlier float of the same type is  
put on the bottom.  
If the float is put in the text, then  
`\penalty\interlinepenalty` is put  
right after the float, before the following `\vskip`,  
and `\outputpenalty :=L 0`.

`\@addtonextcol` : Tries to add `\@currbox` to the next column, setting  
`@insert` true if it succeeds, false otherwise.

`\@addtodblcol` : Tries to add `\@currbox` to the next double-column page,  
adding it to `\@dbltoplist` if it succeeds and  
`\@dbldeferlist` if it fails.

```
\@addmarginpar ==
BEGIN
  if \@currlist nonempty
    then remove \@marbox from \@currlist
      add \@marbox and \@currbox to \@freelist
      %% NOTE: \@currbox = left box
    else LaTeX error: ? %% shouldn't happen
  fi
  \@tempcnta := 1      %% 1 = right, -1 = left
  if @twocolumn = true
    then if @firstcolumn = true
      then \@tempcnta := -1
    fi
    else if @mparswitch = true
      then if count0 odd
        else \@tempcnta := -1
      fi
    fi
    if @reversemargin = true
      then \@tempcnta := -\@tempcnta
    fi
  fi
  if \@tempcnta < 0 then \box\@marbox :=G \box\@currbox
  fi
  \@tempdima :=L maximum(\@mparbottom - \@pageht
                        + ht of \@marbox, 0)
  if \@tempdima > 0 then LaTeX warning: 'marginpar moved' fi
  \@mparbottom :=G \@pageht + \@tempdima + depth of \@marbox
                + \marginparpush
```

```

\@tempdima :=L \@tempdima - ht of \@marbox
\box\@marbox :=G \box\@currbox
\hbox{ \vbox { \vskip \@tempdima
\box\@marbox
}
height of \@marbox :=G depth of \@marbox :=G 0
\kern -\@pagedp
\nointerlineskip
\hbox{ if @tempcnta > 0 then \hskip \columnwidth
\hskip \marginparsep
else \hskip -\marginparsep
\hskip -\marginparwidth
fi
\box\@marbox \hss
}
\nobreak
\nointerlineskip
\hbox{\vrule height 0 width 0 depth \@pagedp}
END

```

Floats and marginpars add a lot of dead cycles.  
*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

```

7 \maxdeadcycles = 100
8 \let\@elt\relax
9 \def\@next#1#2#3#4{\ifx#2\@empty #4\else
10 \expandafter\@xnext #2\@#1#2#3\fi}
11 \def\@xnext \@elt #1#2\@#3#4{\def#3{#1}\gdef#4{#2}}
12 \def\@testfalse{\global\let@if@test\iffalse}
13 \def\@testtrue {\global\let@if@test\iftrue}
14 \@testfalse
15 \def\@bitor#1#2{\@testfalse {\let\@elt\@xbitor
16 \@tempcnta #1\relax #2}}

```

RmS 91/11/22: Added test for \count#1 = 0. Suggested by Chris Rowley.

```

17 \def\@xbitor #1{\@tempcntb \count#1
18 \ifnum \@tempcnta =\z@
19 \else
20 \divide\@tempcntb\@tempcnta
21 \ifodd\@tempcntb \@testtrue\fi
22 \fi}

```

#### DEFINITION OF FLOAT BOXES:

```

23 </2ekernel>
24 <latexrelease>\IncludeInRelease{2015/10/01}%
25 <latexrelease> \bx@ZZ{Extended float list}%
26 <*2ekernel|latexrelease>
27 \let\@elt\newinsert
28 <*2ekernel>
29 \def\@freelist{%

```



```

30 \@elt\bx@A\@elt\bx@B\@elt\bx@C\@elt\bx@D\@elt\bx@E
31 \@elt\bx@F\@elt\bx@G\@elt\bx@H\@elt\bx@I\@elt\bx@J
32 \@elt\bx@K\@elt\bx@L\@elt\bx@M\@elt\bx@N
33 \@elt\bx@O\@elt\bx@P\@elt\bx@Q\@elt\bx@R}
34 \@freelist
35 </2ekernel>
36 \ifx\numexpr\@undefined\else
37 \def\reserved@a{%
38 \@elt\bx@S\@elt\bx@T\@elt\bx@U\@elt\bx@V
39 \@elt\bx@W\@elt\bx@X\@elt\bx@Y\@elt\bx@Z
40 \@elt\bx@AA\@elt\bx@BB\@elt\bx@CC\@elt\bx@DD\@elt\bx@EE
41 \@elt\bx@FF\@elt\bx@GG\@elt\bx@HH\@elt\bx@II\@elt\bx@JJ
42 \@elt\bx@KK\@elt\bx@LL\@elt\bx@MM\@elt\bx@NN
43 \@elt\bx@OO\@elt\bx@PP\@elt\bx@QQ\@elt\bx@RR
44 \@elt\bx@SS\@elt\bx@TT\@elt\bx@UU\@elt\bx@VV
45 \@elt\bx@WW\@elt\bx@XX\@elt\bx@YY\@elt\bx@ZZ}
46 \reserved@a
47 \def\@elt{\noexpand\@elt\noexpand}
48 \edef\@freelist{\@freelist\reserved@a}
49 \fi
50 \let\reserved@a\relax
51 \let\@elt\relax
52 </2ekernel | latexrelease>
53 <latexrelease>\EndIncludeInRelease
54 <latexrelease>\IncludeInRelease{0000/00/00}%
55 <latexrelease> \@elt\bx@ZZ{Extended float list}%
56 <latexrelease>\def\@freelist{%
57 <latexrelease> \@elt\bx@A\@elt\bx@B\@elt\bx@C\@elt\bx@D\@elt\bx@E
58 <latexrelease> \@elt\bx@F\@elt\bx@G\@elt\bx@H\@elt\bx@I\@elt\bx@J
59 <latexrelease> \@elt\bx@K\@elt\bx@L\@elt\bx@M\@elt\bx@N
60 <latexrelease> \@elt\bx@O\@elt\bx@P\@elt\bx@Q\@elt\bx@R}
61 <latexrelease> \insscount=234
62 <latexrelease>\EndIncludeInRelease
63 <*2ekernel>

64 \gdef\@toplist{}
65 \gdef\@botlist{}
66 \gdef\@midlist{}
67 \gdef\@currlist{}
68 \gdef\@deferlist{}
69 \gdef\@dbltoplist{}

The new algorithm stores page wide floats together with column floats in a single
\@deferlist list. We keep \@dbldeferlist initialised as empty so that packages that
are testing for deferred floats can use the same code for old or new float handling.

70 \gdef\@dbldeferlist{}

PAGE LAYOUT PARAMETERS

71 \newdimen\topmargin
72 \newdimen\oddsidemargin
73 \newdimen\evensidemargin
74 \let\@themargin=\oddsidemargin
75 \newdimen\headheight
76 \newdimen\headsep
77 \newdimen\footskip

```

```

78 \newdimen\textheight
79 \newdimen\textwidth
80 \newdimen\columnwidth
81 \newdimen\columnsep
82 \newdimen\columnseprule
83 \newdimen\marginparwidth
84 \newdimen\marginparsep
85 \newdimen\marginparpush

```

**\AtBeginDvi** We use a box register in which to put stuff that must appear before anything else in the .dvi file.

The stuff in the box should not add any typeset material to the page when it is unboxed.

This interface is no longer used. Instead a new one is inside `ltshipout.dtx`. We only keep the box in case some old code refers to it directly (or we do some rollback).

```

86 \newbox\@begindvibox
87 %\DeclareRobustCommand \AtBeginDvi [1]{%
88 % \global \setbox \@begindvibox
89 % \vbox{\unvbox \@begindvibox #1}%
90 %}

```

*(End definition for \AtBeginDvi and \@begindvibox. These functions are documented on page 901.)*

**\@maxdepth** This is not the right place to set this; it needs to be set in a class/style file when `\maxdepth` is set.

Also, many settings to `\maxdepth` should be to `\@maxdepth`, probably?

```

91 \newdimen\@maxdepth
92 \@maxdepth = \maxdepth

```

*(End definition for \@maxdepth.)*

**\paperheight** New `\paper...` registers.  
**\paperwidth**

```

93 \newdimen\paperheight
94 \newdimen\paperwidth

```

*(End definition for \paperheight and \paperwidth.)*

**\if@insert** Local switches first:

**\if@fcolmade** `\newif \if@insert`

**\if@specialpage** These should definitely be global:

```

96 \newif \if@fcolmade
97 \newif \if@specialpage \@specialpagefalse

```

**\if@twocolumn**

**\if@twoside**

**\if@reversemarginpar** These should be global but are not always set globally in other files.

**\if@mparswitch** `\newif \if@firstcolumn \@firstcolumntrue`

**\col@number** `\newif \if@twocolumn \@twocolumnfalse`

Not sure about these: two questions. Should things which must apply to a whole document be local or global (they probably should be ‘preamble only’ commands)? Are these three such things?

```

100 \newif \if@twoside \@twosidefalse
101 \newif \if@reversemargin \@reversemarginfalse
102 \newif \if@mparswitch \@mparswitchfalse

```

This counter has been imported from ‘multicol’.

```
103 \newcount \col@number
104 \col@number \@ne
```

(End definition for \if@insert and others.)

Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):

INTERNAL REGISTERS

```
105 \newcount\@topnum
106 \newdimen\@toproom
107 \newcount\@dbltopnum
108 \newdimen\@dbltoproom
109 \newcount\@botnum
110 \newdimen\@botroom
111 \newcount\@colnum
112 \newdimen\@textmin
113 \newdimen\@fpmmin
114 \newdimen\@colht
115 \newdimen\@colroom
116 \newdimen\@pageht
117 \newdimen\@pagedp
118 \newdimen\@mparbottom \@mparbottom\z@
119 \newcount\@currtype
120 \newbox\@outputbox
121 \newbox\@leftcolumn
122 \newbox\@holdpg
```

```
123 \def\@thehead{\@oddhead} % initialization
124 \def\@thefoot{\@oddfoot}
```

End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.

**\clearpage** The tests at the beginning are an experimental attempt to avoid a completely empty page after a \twocolumn[...]. This prevents the text from the argument vanishing into a float box, never to be seen again. We hope that it does not produce wrong formatting in other cases.

```
125 \def\clearpage{%
126   \ifvmode
127     \ifnum \@dbltopnum =\m@ne
128       \ifdim \pagetotal <\topskip
129         \hbox{}%
130       \fi
131     \fi
132   \fi
133   \newpage
134   \write\m@ne{}%
135   \vbox{}%
136   \penalty -\@Mi
137 }
```

(End definition for \clearpage.)

`\cleardoublepage`

```
138 \def\cleardoublepage{\clearpage\if@twoside \ifodd\c@page\else
139   \hbox{}\newpage\if@twocolumn\hbox{}\newpage\fi\fi\fi}
140 \endkernel
```

*(End definition for \cleardoublepage.)*

`\onecolumn`

```
141 \*2ekernel | fltrace)
142 \def\onecolumn{%
143   \clearpage
144   \global\columnwidth\textwidth
145   \global\hsize\columnwidth
146   \global\linewidth\columnwidth
147   \global\@twocolumnfalse
148   \col@number \@one
149   \@floatplacement}
```

*(End definition for \onecolumn.)*

`\newpage` The two checks at the beginning ensure that an item label or run-in section title immediately before a `\newpage` get printed on the correct page, the one before the page break.

All three tests are largely to make error processing more robust; that is why they all reset the flags explicitly, even when it would appear that this would be done by a `\leavevmode`.

```
150 \endkernel | fltrace)
151 \<latexrelease>\IncludeInRelease{2017/04/15}%
152 \<latexrelease>{\newpage}{Check depth of page}%
153 \*2ekernel | latexrelease | fltrace)
154 \def \newpage {%
155   \if@noskipsec
156     \ifx \@nodocument\relax
157       \leavevmode
158       \global \@noskipsecfalse
159     \fi
160   \fi
161   \if@inlabel
162     \leavevmode
163     \global \@inlabelfalse
164   \fi
165   \if@nobreak \@nobreakfalse \everypar{}\fi
166   \par
```

The `\vfil` at the end of the macro before the break penalty will normally result in the page being run short, even with `\flushbottom` in effect (in contrast to the behavior of `\pagebreak`). However, if there is some explicit stretch on the page, say, a `\vfill`, it has the undesired side-effect, that the last line will not align at its baseline if it contains characters going below the baseline, as the value of `\prevdepth` is no longer taken into account by  $\mathrm{T}_{\mathrm{E}}\mathrm{X}$ . So we back up by that amount (or by `\maxdepth` if it is really huge), to mimic the normal behavior without the `\newpage`.

```
167   \ifdim\prevdepth>\z@
168     \vskip -%
169     \ifdim\prevdepth>\maxdepth
```

```

170         \maxdepth
171     \else
172         \prevdepth
173     \fi
174 \fi
175 \vfil
176 \penalty -\@M}
177 </2ekernel | latexrelease | fltrace>
178 <latexrelease>\EndIncludeInRelease
179 <latexrelease>\IncludeInRelease{0000/00/00}%
180 <latexrelease>         {\newpage}{Check depth of page}%
181 <latexrelease>\def \newpage {%
182 <latexrelease> \if@noskipsec
183 <latexrelease> \ifx \@nodocument\relax
184 <latexrelease> \leavevmode
185 <latexrelease> \global \@noskipsecfalse
186 <latexrelease> \fi
187 <latexrelease> \fi
188 <latexrelease> \if@inlabel
189 <latexrelease> \leavevmode
190 <latexrelease> \global \@inlabelfalse
191 <latexrelease> \fi
192 <latexrelease> \if@nobreak \@nobreakfalse \everypar{}\fi
193 <latexrelease> \par
194 <latexrelease> \vfil
195 <latexrelease> \penalty -\@M}
196 <latexrelease>\EndIncludeInRelease
197 <*2ekernel | fltrace>

```

(End definition for \newpage.)

\@emptycol It may be better to use an invisible rule rather than an empty box here.

```

198 \def \@emptycol {\vbox{}\penalty -\@M}

```

(End definition for \@emptycol.)

\twocolumn There are several bug fixes to the two-column stuff here.  
\@topnewpage

```

199 \def \twocolumn {%
200 \clearpage
201 \global\columnwidth\textwidth
202 \global\advance\columnwidth-\columnsep
203 \global\divide\columnwidth\tw@
204 \global\hsize\columnwidth
205 \global\linewidth\columnwidth
206 \global\@twocolumntrue
207 \global\@firstcolumntrue
208 \col@number \tw@

```

There is no reason to put a \@dblfloatplacement here since \@topnewpage ignores these settings. The \@floatplacement is needed in case this comes after some changes.

```

209 \ifnextchar [\@topnewpage\@floatplacement
210 }

```

Note that here, getting a box from the freelist can assume success since this comes just after a `\clearpage`.

```

211 \long\def \@topnewpage [#1]{%
212   \nodocument
213   \@next\@currbox\@freelist{}{}%
214   \global \setbox\@currbox
215     \color@vbox
216     \normalcolor
217     \vbox {%
218       \hsize\textwidth
219       \@parboxrestore
220       \col@number \@ne
221       #1%
222       \vskip -\dbltextfloatsep
223     }%
224   \color@endbox

```

Added size test and warning message; perhaps we should use an error message.

```

225   \ifdim \ht\@currbox>\textheight
226     \ht\@currbox \textheight
227   \fi

```

This next line is not essential but it is more robust to make this value non-zero, in case of weird errors.

This next bit is what is needed from `\@addtodblcol`, plus some extra checks for error trapping.

```

228   \global \count\@currbox \tw@
229   \@tempdima -\ht\@currbox
230   \advance \@tempdima -\dbltextfloatsep
231   \global \advance \@colht \@tempdima
232   \ifx \@dbltoplist \@empty
233   \else
234     \@latex@error{Float(s) lost}\@ehb
235     \let \@dbltoplist \@empty
236   \fi
237   \@cons \@dbltoplist \@currbox

```

This setting of `\@dbltopnum` is used only to change the typesetting in `\@combinedblfloats`.

```

238   \global \@dbltopnum \m@ne
239   <*trace>
240     \fl@trace{dbltopnum set to -1 (= \the \@dbltopnum) (topnewpage)}%
241   </trace>

```

At points such as this we need to check that there is still a minimal amount of room left on the page; this uses an arbitrary small value at present; but note that this value is larger than that used when checking that page is too full of normal floats.

If there is little room left we just force a page-break, OK? This involves producing two empty columns. The second empty column may be produced by `\output`, in which case an extra, misleading, warning will be generated, OK? (This happens only when there is too little room left on the page for any float.) Otherwise (i.e. if the size is such that it is allowed as a normal float) the extra `\@emptycol` will be invoked in the second column by the conditional code guarded by the `\if@firstcolumn` test.

I now think that the cut-off point here should be `3\baselineskip`, but we make it a bit less so that 3 lines of text will be allowed, OK?

Since this happens only when there is nothing on the page but the ‘top-box’, the empty box should not cause any problem other than some overfull box messages, which is not entirely misleading.

Here we need two page-ends since both columns need to be empty.

```

242 \ifdim \@colht<2.5\baselineskip
243   \@latex@warning@no@line {Optional argument of \noexpand\twocolumn
244     too tall on page \thepage}%
245   \@emptycol
246   \if@firstcolumn
247   \else
248     \@emptycol
249   \fi
250 \else
251   \global \vsize \@colht
252   \global \@colroom \@colht
253   \@floatplacement
254 \fi
255 }
```

*(End definition for \twocolumn and \@topnewpage.)*

`\output` This needs some small adjustments. We cannot guarantee that the float mechanism will  
`\@specialoutput` interact correctly with this stuff, but that mechanism does not always work properly with footnotes already.

RmS 91/09/29:

added reset of `\par` to the output routine. This avoids problems when the output routine is called within a list where `\par` may be a no-op.

```

256 \output {%
257   \let \par \@@par
258   \ifnum \outputpenalty<-\@M
259     \@specialoutput
260   \else
261     \@makecol
262     \@opcol
```

Moved to `\@opcol: \@floatplacement`.

```

263   \@startcolumn
```

This loop could be replaced by an `\expandafter` tail recursion in `\@startcolumn`.

```

264   \@whilesw \if@fcolmade \fi
265   {%
266   < *trace>
267     \fl@trace{PAGE: float \if@twocolumn column \else page \fi
268       completed}%
269   < /trace>
270     \@opcol\@startcolumn}%
271   \fi
272   \ifnum \outputpenalty>-\@Miv
```

At points such as this we need to check that there is still a minimal amount of room left on the page; this uses an arbitrary small value at present. If there is little room left we just force a page-break, OK?

This bit is essential only if a float has just been processed so maybe it should be moved; but this is the natural place at which to set the vsize and a test would need to be done anyway. A check has been added to ensure that there really has been a change in the value of \@colroom.

Since this happens only when there is nothing on the page but floats, the empty box should not cause any problem other than some overfull box messages, which is not entirely misleading.

The twocolumn case does not need any extra code here since this is the \output itself; in the second column there will still not be enough room left so \@emptycol will be executed again when the OR is called by the-page builder when it gets to the penalty inserted by the first execution. (The page-builder is never invoked whilst the OR is being executed since it builds a inner vlist; thus any conditional code for the two-column case within \output may not get executed with the correct value of \if@firstcolumn.

```

273   \ifdim \@colroom<1.5\baselineskip
274   \ifdim \@colroom<\textheight
275       \@latex@warning@no@line {Text page \thepage\space
276                               contains only floats}%
277   \@emptycol
278   %       \if@twocolumn
279   %       \if@firstcolumn
280   %       \else
281   %       \@emptycol
282   %       \fi
283   %       \fi
284   \else
285       \global \vsize \@colroom
286   \fi
287   \else
288       \global \vsize \@colroom
289   \fi
290   \else
291       \global \vsize \maxdimen
292   \fi
293 }

```

*Historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments (not necessarily accurate any more):*

CHANGES TO \@specialoutput:

\* \penalty\z@ changed to \penalty\interlinepenalty so \samepage works properly with figure and table environments.

(Changed 23 Oct 86)

\* Definition of \@specialoutput changed 26 Feb 88 so \@pageht and \@pagedp aren't changed for a marginal note.

(Change suggested by Chris Rowley.)

*End of historical L<sup>A</sup>T<sub>E</sub>X 2.09 comments.*

```

294 \gdef\@specialoutput{%
295     \ifnum \outputpenalty>-\@Mii
296         \doclearpage

```



```

297 \else
298 \ifnum \outputpenalty<-\@Miii
299 \ifnum \outputpenalty<-\@MM \deadcycles \z@ \fi
300 \global \setbox\@holdpg \vbox {\unvbox\@cclv}%
301 \else

```

Note that `\boxmaxdepth` should not be set here since we wish to record the natural depth of the holdpg box.

This is changed so as to not lose anything, such as writes and marks, which may get into box 255 and should be returned to the list. This should only happen when the first penalty in the mechanism is discarded and therefore `\@holdpg` should always be void in this case. This can happen because a penalty is discarded whenever there is no box on the list.

It was just: `\setbox\@tempboxa \box \@cclv`.

The last box which is removed is the box put there by the double-penalty mechanism. The `\unskip` then removes the `\topskip` which is put there since the box is the first on the page.

```

302 \global \setbox\@holdpg \vbox{%
303 \unvbox\@holdpg
304 \unvbox\@cclv

```

We must now remove the box added by the float mechanism and the `\topskip` glue therefore added above it by T<sub>E</sub>X.

```

305 \setbox\@tempboxa \lastbox
306 \unskip
307 }%

```

These two are needed as separate dimensions only by `\@addmarginpar`; for other purposes we put the whole size into `\@pageht` (see below).

```

308 \@pagedp \dp\@holdpg
309 \@pageht \ht\@holdpg
310 \unvbox \@holdpg
311 \@next\@currbox\@currlist{%
312 \ifnum \count\@currbox>\z@

```

Putting the whole size into `\@pageht` (see above).

```

313 \advance \@pageht \@pagedp
314 \ifvoid\footins \else
315 \advance \@pageht \ht\footins
316 \advance \@pageht \skip\footins
317 \advance \@pageht \dp\footins
318 \fi
319 \ifvbox \@kludgeins

```

We want to make the adjustment due to this insert only if the non-star form is used. The \*-form will probably not work with floats, but maybe it still could make some adjustment here even so?

```

320 \ifdim \wd\@kludgeins=\z@
321 \advance \@pageht \ht\@kludgeins
322 (*trace)
323 \fl@trace {Extra size added: \the \ht\@kludgeins}%
324 (/trace)
325 \fi
326 \fi

```

This version puts the inserts back just before the additional material; it could be moved earlier, before unboxing the page-so-far. Neither is guaranteed not to put things on the wrong page. This version is similar to the original version.

```

327         \@reinserts
328         \@addtocurcol
329     \else
330         \@reinserts
331         \@addmarginpar
332     \fi
333 } \@latexbug

```

A 2e change: use `\addpenalty` instead of `\penalty` here. Some penalty is needed to create a potential break-point immediately after the reinserts (or the marginal). Otherwise there can be no possibility to break here and this can cause the reinserts or the marginal to appear on the next page (which is often incorrect). However, if the nobreak flag is true, a `\nobreak` must be correct.

```

334     \ifnum \outputpenalty<\z@
335     \if@nobreak
336         \nobreak
337     \else
338         \addpenalty \interlinepenalty
339     \fi
340 \fi
341 \fi
342 \fi
343 }
344 </2ekernel | fltrace>

```

(End definition for `\output` and `\@specialoutput`.)

`\@testwrongwidth` Test if the float box has the wrong width when trying to place it into some area. (Actually the test is for a conventional depth setting rather than for the width of the float. For that reason the box depth was explicitly tailored when the float was created).

`\f@depth`

```

345 <latexrelease>\IncludeInRelease{2015/01/01}%
346 <latexrelease>          {\@testwrongwidth}{float order in 2-column}%
347 <*2ekernel | latexrelease | fltrace>

348 \def\@testwrongwidth #1{%
349     \ifdim\dp#1=\f@depth
350 <*trace>
351         \fl@trace{\string#1
352             \ifdim\f@depth=\z@ single \else double \fi
353             column float -- ok}%
354 </trace>
355     \else
356         \global\@testtrue
357 <*trace>
358         \fl@trace{\string#1
359             \ifdim\f@depth=\z@ double \else single \fi
360             column float -- wrong}%
361 </trace>
362     \fi}%

```

Normally looking for single column floats, which have zero depth.

```

363 \let\f@depth\z@

```

```

364 </2ekernel | latexrelease | fltrace>
365 <latexrelease>\EndIncludeInRelease
366 <latexrelease>\IncludeInRelease{0000/00/00}%
367 <latexrelease>{\@testwrongwidth}{float order in 2-column}%
368 <latexrelease>\let\@testwrongwidth\@undefined
369 <latexrelease>\let\f@depth\@undefined
370 <latexrelease>\EndIncludeInRelease

```

(End definition for \@testwrongwidth and \f@depth.)

\@docclearpage This is a very much an emergency action, just dumping everything: footnotes first then floats. A more sophisticated version is needed; but even more urgent is a bug-free version (see, for example, pr/3528).

Also, it puts any left-over non-boxes (writes, specials, etc.) back after any float pages created: this is a very bad bug since, for example, a kludge insert will be in quite the wrong place and, worse, be irremovable and uncancellable.

All the remaining changes are replacing the double column defer list or inserting the extra test \@testwrongwidth{<box>} at suitable places. That is at places where a box is taken off the deferlist.

```

371 <latexrelease>\IncludeInRelease{2015/01/01}{\@docclearpage}%
372 <latexrelease>{\float order in 2-column}%
373 <*2ekernel | latexrelease>
374 \def \@docclearpage {%
375     \ifvoid\footins
376         \ifvbox\@kludgeins
377             {\setbox \@tempboxa \box \@kludgeins}%
378 <*trace>
379             \fl@trace {kludgeins box made void}%
380 </trace>
381         \fi
382         \setbox\@tempboxa\vsplit\@cclv to\z@ \unvbox\@tempboxa
383         \setbox\@tempboxa\box\@cclv
384         \xdef\@deferlist{\@toplist\@botlist\@deferlist}%
385         \global \let \@toplist \@empty
386         \global \let \@botlist \@empty
387         \global \@colroom \@colht
388         \ifx \@currlist\@empty
389             \else
390                 \@latexerror{Float(s) lost}\@ehb
391                 \global \let \@currlist \@empty
392             \fi
393         \@makefcolumn\@deferlist
394         \@whilesw\if@fcolmade \fi{\@opcol\@makefcolumn\@deferlist}%
395         \if@twocolumn
396             \if@firstcolumn
397                 \xdef\@deferlist{\@dbltoplist\@deferlist}%
398                 \global \let \@dbltoplist \@empty
399                 \global \@colht \textheight
400                 \begingroup
401                 \@dblfloatplacement

```

```

402             \@makefcolumn\@deferlist
403             \@whiles\if@fcolmade \fi{\@outputpage
404                                     \@makefcolumn\@deferlist}%
405         \endgroup
406     \else
407         \vbox{}\clearpage
408     \fi
409 \fi

```

the next line is needed to avoid losing floats in certain circumstances a single call to the original `\docclearpage` will now no longer output all floats.

```

410     \ifx\@deferlist\@empty \else\clearpage \fi
411 \else
412     \setbox\@cclv\vbox{\box\@cclv\vfil}%
413     \@makecol\@opcol
414     \clearpage
415 \fi
416 }%
417 </2kernel | latexrelease>
418 <latexrelease>\EndIncludeInRelease
419 <latexrelease>\IncludeInRelease{0000/00/00}{\@docclearpage}%
420 <latexrelease>                                {float order in 2-column}%
421 <latexrelease>\def \@docclearpage {%
422 <latexrelease>    \ifvoid\footins

```

We empty any left over kludge insert box here; this is a temporary fix. It should perhaps be applied to one page of cleared floats, but who cares? The whole of this stuff needs completely redoing for many such reasons.

```

423 <latexrelease>    \ifvbox\@kludgeins
424 <latexrelease>    {\setbox \@tempboxa \box \@kludgeins}%
425 <*trace>
426 <latexrelease>    \fl@trace {kludgeins box made void}%
427 </trace>
428 <latexrelease>    \fi
429 <latexrelease>    \setbox\@tempboxa\vsplit\@cclv to\z@ \unvbox\@tempboxa
430 <latexrelease>    \setbox\@tempboxa\box\@cclv
431 <latexrelease>    \xdef\@deferlist{\@toplist\@botlist\@deferlist}%
432 <latexrelease>    \global \let \@toplist \@empty
433 <latexrelease>    \global \let \@botlist \@empty
434 <latexrelease>    \global \@colroom \@colht
435 <latexrelease>    \ifx \@currlist\@empty
436 <latexrelease>    \else
437 <latexrelease>        \@latexerr{Float(s) lost}\@ehb
438 <latexrelease>    \global \let \@currlist \@empty
439 <latexrelease>    \fi
440 <latexrelease>    \@makefcolumn\@deferlist
441 <latexrelease>    \@whiles\if@fcolmade \fi
442 <latexrelease>        {\@opcol\@makefcolumn\@deferlist}%
443 <latexrelease>    \if@twocolumn
444 <latexrelease>        \if@firstcolumn
445 <latexrelease>            \xdef\@dbldeferlist{\@dbltoplist\@dbldeferlist}%

```

```

446 <latexrelease>          \global \let \@dbltoplist \@empty
447 <latexrelease>          \global \@colht \textheight
448 <latexrelease>          \begingroup
449 <latexrelease>            \dblfloatplacement
450 <latexrelease>            \makefcolumn\@dbldeferlist
451 <latexrelease>            \whiles\if@fcolmade \fi
452 <latexrelease>            {\@outputpage\@makefcolumn\@dbldeferlist}%
453 <latexrelease>          \endgroup
454 <latexrelease>          \else
455 <latexrelease>            \vbox{}\clearpage
456 <latexrelease>          \fi
457 <latexrelease>          \fi
458 <latexrelease>          \else
459 <latexrelease>            \setbox\@cclv\vbox{\box\@cclv\vfil}%
460 <latexrelease>            \makecol\@opcol
461 <latexrelease>            \clearpage
462 <latexrelease>          \fi
463 <latexrelease>        }%
464 <latexrelease>\EndIncludeInRelease

```

*(End definition for \doclearpage.)*

**\@opcol** Several changes in detail here.

```

465 <*2kernel | ftrace>
466 \def \@opcol {%
467   \if@twocolumn

```

The funny-looking internal commands are interfacing with the new marks mechanism. We make sure (elsewhere) that those are always defined, even when we roll back, so here we add them unconditionally. This still need turning into a hook or config point eventually:

```

468   \@expl@@@mark@update@dblcol@structures@@
469   \@outputdblcol
470 \else
471   \@expl@@@mark@update@singlecol@structures@@
472   \@outputpage
473 <*trace>
474   \fl@trace{PAGE: one column (float? see above) page completed}%
475 </trace>

```

Not needed since it comes after \@outputpage:

```

476 %   \global\@colht\textheight
477   \fi

```

These do not need to be done every time \@opcol is used: they should be grouped together since they all need to be done at the end of the non-special output routine, or at the end of a clearpage one.

```

478   \global \mparbottom \z@ \global \textfloatsheight \z@
479   \floatplacement
480 }
481 </2kernel | ftrace>

```

*(End definition for \@opcol.)*

`\@makecol` We must rewrite this macro to allow for variations in page-makeup required by changes in page-length.

This uses a different macro if a special-length column is being produced.

```

482 (*2kernel)
483 \gdef \@makecol {%
484   \ifvoid\footins
485     \setbox\@outputbox \box\@cclv
486   \else
487     \setbox\@outputbox \vbox {%

```

This `\boxmaxdepth` setting is to ensure that deep footnotes do not overwrite the footer (on account of the negative skip added later): it should use `\@maxdepth` otherwise the change is pointless when there are footnotes.

But see also its use when combining floats.

```

488   \boxmaxdepth \@maxdepth

489 %       \@tempdima\dp\@cclv
490   \unvbox \@cclv
491 %       \vskip-\@tempdima
492   \vskip \skip\footins

493   \color@begingroup
494     \normalcolor
495     \footnoterule
496     \unvbox \footins
497   \color@endgroup
498 }%
499 \fi

```

The h floats have now been finally committed to this page so we can reset their list. The top and bottom floats are then added to the page.

```

500   \let\@elt\relax
501   \xdef\@freelist{\@freelist\@midlist}%

502   \global \let \@midlist \@empty
503   \@combinefloats

```

The variations start here in case `\enlargethispage` has been used.

```

504   \ifvbox\@kludgeins
505     \@makespecialcolbox
506   \else

```

This extra reboxing is only needed to add the `\@texttop` and `\@textbottom` but this could be done earlier, when the floats are added.

The `\boxmaxdepth` resetting here will have no effect unless `\@textbottom` ends with a box or rule. So is this (or possibly `\@maxdepth`) the correct value?

The `\vskip -\dimen@` ensures that the visible depth of the box does not affect the placement of anything on the page. Thus very deep pages will overprint the footer; but these should have been prevented by suitable settings of the maxdepths at appropriate times.

If `\@textbottom` ends with a box or rule of non-zero depth then this skip adjustment should be done again after it.

I think that the final boxing of the main text page could have a common ending which may make it simpler to see what is going on.

This needs further investigation, especially in the ‘special case’.

Also, the `\boxmaxdepth` setting here affects what happens within `\@texttop` and `\@textbottom`, should it? Is it needed at all?

RmS 91/10/22: Replaced `\dimen128` by `\dimen@`.

```

507 \setbox\@outputbox \vbox to\@colht {%
508 % \boxmaxdepth \maxdepth %??
509 \@texttop
510 \dimen@ \dp\@outputbox
511 \unvbox \@outputbox
512 \vskip -\dimen@
513 \@textbottom
514 }%
515 \fi
516 \global \maxdepth \@maxdepth
517 }

```

*(End definition for \makecol.)*

**\@reinserts** This is the code which reinserts the inserts. It puts them all in one place; this can make some of them come out on the wrong page. It has been put into a separate macro to expedite experimentation.

```

518 \gdef \@reinserts{%
519 \ifvoid\footins\else\insert\footins{\unvbox\footins}\fi
520 \ifvbox\@kludgeins\insert\@kludgeins
521 {\unvbox\@kludgeins}\fi
522 }
523 \</2ekernel>

```

*(End definition for \@reinserts.)*

**\@makespecialcolbox** This implements certain variations in page-makeup.

```

524 \<*2ekernel | fltrace>
525 \gdef \@makespecialcolbox {%
526 \<*trace>
527 \fl@trace{Kludgeins ht \the\ht\@kludgeins\space
528 dp \the\dp\@kludgeins\space
529 wd \the\wd\@kludgeins}%
530 \</trace>

```

First we find the natural height of the column.

See above for discussion of what is happening here.

This needs further investigation, especially in this ‘special case’.

```

531 \setbox\@outputbox \vbox {%
532 \@texttop
533 \dimen@ \dp\@outputbox
534 \unvbox\@outputbox
535 \vskip-\dimen@
536 }%
537 \@tempdima \@colht
538 \ifdim \wd\@kludgeins>\z@

```

Note that in this case (the \*-version), the height of the `\@kludgeins` box is not used since its value is somewhat arbitrary: it need only be big enough to ensure that the page-break is not taken prematurely.

Here we calculate how much vertical space needs to be added in order to enable the column to fit into a box of size `\@colht` using the best information we have about the amount of shrink available (another thing which is known internally about a box, but cannot be accessed at the  $\TeX$  level!).

This needs  $\TeX$ 3 otherwise `\pageshrink` is zero anyway; it may not be exactly the figure we wish as it is the total available from the all the material collected before the page-break decision is made. It will, we think, always be an overestimate of the actual shrink in the box; therefore this should always force the shortest possible column with the possibility of an overfull box.

This should work for both flush- and ragged-bottom setting since it makes the contents no smaller than the size (`\@colht`) of the box into which they are put.

Their should perhaps be an upper limit, of 0pt?, on the extra space added to force shrinking.

See above for a discussion of the `\boxmaxdepth` setting here.

```

539     \advance \@tempdima -\ht\@outputbox
540     \advance \@tempdima \pageshrink
541 <*trace>
542     \fl@trace {Natural ht of col: \the \ht\@outputbox}%
543     \fl@trace {\string \@colht: \the \@colht}%
544     \fl@trace {Pageshrink added: \the \pageshrink}%
545     \fl@trace {Hence, space added: \the \@tempdima}%
546 </trace>
547     \setbox\@outputbox \vbox to \@colht {%
548 %       \boxmaxdepth \maxdepth
549       \unvbox\@outputbox
550       \vskip \@tempdima
551       \textbottom
552     }%
```

For the unstarred version, the final size of the page is precisely specified. Therefore, at least for the flush-bottom case, we need to ensure that, visually, it has this size exactly.

Thus we calculate this size and set the material in a box of this size, which is then put into a box of size `\@colht` with `\vss` at the bottom.

```

553     \else
554     \advance \@tempdima -\ht\@kludgeins
555 <*trace>
556     \fl@trace {Natural ht of col: \the \ht\@outputbox}%
557     \fl@trace {\string \@colht: \the \@colht}%
558     \fl@trace {Extra size added: -\the \ht \@kludgeins}%
559     \fl@trace {Hence, height of inner box: \the \@tempdima}%
560     \fl@trace {Max? pageshrink available: \the \pageshrink}%
561 </trace>
```

This type of final packaging could be done always; this may simplify all of this page-makeup.

It is not necessary to set `\boxmaxdepth` here since the `\@outputbox` ends with glue.

```

562     \setbox \@outputbox \vbox to \@colht {%
563       \vbox to \@tempdima {%
```



```

564         \unvbox\@outputbox
565         \@textbottom}%
566     \vss}%
567 \fi

```

Finally we need to explicitly make the insert box void.

```

568     {\setbox \@tempboxa \box \@kludgeins}%
569 \<trace>
570     \fl@trace {kludgeins box made void}%
571 \</trace>
572 }
573 \</2ekernel | fltrace>

```

*(End definition for \@makespecialcolbox.)*

```

\@texttop These do nothing as a default.
\@textbottom
574 \<*2ekernel>
575 \let \@texttop \relax
576 \let \@textbottom \relax

```

*(End definition for \@texttop and \@textbottom.)*

**\@resetactivechars** RmS 93/09/06: added hook to protect against certain active characters in the output routine. Default checks are for active space and end-of-line.

```

577 \def\@activechar@info #1{%
578     \@latex@info@no@line {Active #1 character found while
579                             output routine is active
580                             \MessageBreak
581                             This may be a bug in a package file
582                             you are using}%
583 }

```

Do not put any spaces in this next bit!

```

584 \begingroup
585 \obeylines\obeyspaces%
586 \catcode'\'\active%
587 \gdef\@resetactivechars{%
588 \def~M{\@activechar@info{EOL}\space}%
589 \def {\@activechar@info{space}\space}%
590 \let'\active@math@prime}%
591 \endgroup

```

*(End definition for \@resetactivechars and \@activechar@info.)*

**\@outputpage** The `\color@hbox` hooks here are used to avoid putting just a colour special into an otherwise empty box (in a header or footer). These boxes are often set to be completely empty and so adding a special produces a very underfull box message.

**\@shipoutsetup**

**\@writesetup**

There has been extensive tidying up of the old code here; including the removal of a level of grouping.

The setting of `\protect` immediately before the `\shipout` is needed so that protected commands within `\writes` are handled correctly.

Within shipout's vbox it is reset to its default value, `\relax`.

Resetting it to its default value after the shipout has been completed (and the contents of the writes have been expanded) must be done by use of `\aftergroup`. This

is because it must have the value `\relax` before macros coming from other uses of `\aftergroup` within this box are expanded.

Putting this into the `\aftergroup` token list does not affect the definition used in expanding the `\writes` because the `aftergroup` token list is only constructed when popping the save-stack, it is not expanded until after the shipout is completed.

Question: should things from an `\aftergroup` within the shipped out box be executed in the environment set up for the writes, or after it finishes?

A lot of this code has been in-lined to prevent mis-use of internal commands as hooks.

```
592 </2ekernel>
593 <latexrelease>\IncludeInRelease{2017/04/15}%
594 <latexrelease> {\@outputpage}{Reset language for hyphenation}%
595 <*2ekernel|latexrelease>
596 \def\@outputpage{%
```

The `\endgroup` is put in by `\aftergroup`.

```
597 \begingroup
```

Now all the set-up stuff has been in-lined for Frank.

First the stuff for the writes.

From here ... was in the command `\@writesetup`.

```
598 \let \protect \noexpand
```

RmS 93/08/19: Redefined accents to allow changes in font encoding; but exactly why was this needed?

Reset `\language` to the value current at `\begin{document}`. In particular this ensures that a pagebreak in `verbatim` does not prevent hyphenation in the page head.

```
599 \language\document@default@language
```

The `\catcode'\ = 10` was removed as it was considered useless (presumably because nothing gets tokenized during shipout).

This was put in as some error produced active spaces in a mark, I think.

Why was the hyphen reset?

```
600 \@resetactivechars
```

If a page break happens between the start of a list and its first item the `@newlist` will be true and this will mess up any list that is used in the header or footer of the page. So we have to reset that flag.

```
601 \global\let\@@if@newlist\if@newlist
602 \global\@newlistfalse
```

This next hook replaces the following:

```
\let\-\@dischyph
\let\'\'@acci\let\'\'@accii\let\=\@acciii
\let\\ \@normalcr
\let\par\@par %% 15 Sep 87 (this was once inside the box)
```

and it does more than they did; in particular it sets:

```

\parindent\z@
\parskip\z@skip
\everypar{}%
\leftskip\z@skip
\rightskip\z@skip
\parfillskip\@flushglue
\lineskip\normallineskip
\baselineskip\normalbaselineskip
\sloppy

```

```
603 \@parboxrestore
```

... to here was in the command \@writesetup.

```
604 \shipout \vbox{%
605   \set@typeset@protect
606   \aftergroup \endgroup

```

Correct? or just restore by ending the group?

```
607   \aftergroup \set@typeset@protect

```

This first bit has been moved inside the shipped out box.

Now the setup inside the shipped out box; this should contain all the stuff that could only affect typesetting; other stuff may need to be reset for the writes also.

From here ... was in the command \@shipoutsetup.

```
608 \if@specialpage
609   \global\@specialpagefalse\@nameuse{ps@\@specialstyle}%
610 \fi
611 \if@twoside
612   \ifodd\count\z@ \let\@thehead\@oddhead \let\@thefoot\@oddfoot
613     \let\@themargin\oddsidemargin
614   \else \let\@thehead\@evenhead
615     \let\@thefoot\@evenfoot \let\@themargin\evensidemargin
616   \fi
617 \fi

```

The rest was always inside the box.

RmS 91/08/15: added this line:

```
618 \reset@font

```

RmS 93/08/06 Added \lineskiplimit=0pt to guard against it being nonzero: e.g. by \offinterlineskip being in effect.

There are probably lots of other things that may need resetting.

```
619 \normalsize

```

Reset the space factors.

```
620 \normalsfcodes

```

Reset these here (previously reset separately for head and foot)

```
621 \let\label\@gobble
622 \let\index\@gobble
623 \let\glossary\@gobble
624 \baselineskip\z@skip \lineskip\z@skip \lineskiplimit\z@

```

... to here was in the command \@shipoutsetup.

```
625     \@beginndvi
626     \vskip \topmargin
627     \moveright\@themargin \vbox {%
628         \setbox\@tempboxa \vbox to\headheight{%
629             \vfil
630             \color@hbox
631             \normalcolor
632             \hb@xt@\textwidth{\@thehead}%
633             \color@endbox
```

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```
634         }%
635     \dp\@tempboxa \z@
636     \box\@tempboxa
637     \vskip \headsep
638     \box\@outputbox
639     \baselineskip \footskip
640     \color@hbox
641     \normalcolor
642     \hb@xt@\textwidth{\@thefoot}%
643     \color@endbox
644 }%
645 }%
```

\endgroup now inserted by \aftergroup

Restore \if@newlist

```
646 \global\let\if@newlist\@if@newlist
647 \global \colht \textheight
648 \stepcounter{page}%
```

It is now clear that this does something useful, thanks to Piet van Oostrum. It is needed because a float page is made without using TeX's page-builder; thus the output routine is never called so the marks are not updated.

```
649 \let\firstmark\botmark
650 }
651 </2ekernel | latexrelease>
652 <latexrelease>\EndIncludeInRelease
653 <latexrelease>\IncludeInRelease{0000/00/00}%
654 <latexrelease> {\@outputpage}{Reset language for hyphenation}%
655 <latexrelease>\def\@outputpage{%
656 <latexrelease>\begingroup
657 <latexrelease> \let \protect \noexpand
658 <latexrelease> \resetactivechars
659 <latexrelease> \global\let\@if@newlist\if@newlist
660 <latexrelease> \global\@newlistfalse
661 <latexrelease> \@parboxrestore
662 <latexrelease> \shipout \vbox{%
663 <latexrelease> \set@typeset@protect
664 <latexrelease> \aftergroup \endgroup
665 <latexrelease> \aftergroup \set@typeset@protect
666 <latexrelease> \if@specialpage
667 <latexrelease> \global\@specialpagefalse\@nameuse{ps@\@specialstyle}%
668 <latexrelease> \fi
```

```

669 <latexrelease> \if@twoside
670 <latexrelease> \ifodd\count\z@
671 <latexrelease> \let\@thehead\@oddhead \let\@thefoot\@oddfoot
672 <latexrelease> \let\@themargin\oddsidemargin
673 <latexrelease> \else \let\@thehead\@evenhead
674 <latexrelease> \let\@thefoot\@evenfoot \let\@themargin\evensidemargin
675 <latexrelease> \fi
676 <latexrelease> \fi
677 <latexrelease> \reset@font
678 <latexrelease> \normalsize
679 <latexrelease> \normalsfcodes
680 <latexrelease> \let\label\@gobble
681 <latexrelease> \let\index\@gobble
682 <latexrelease> \let\glossary\@gobble
683 <latexrelease> \baselineskip\z@skip \lineskip\z@skip \lineskiplimit\z@
684 <latexrelease> \@begindvi
685 <latexrelease> \vskip \topmargin
686 <latexrelease> \moveright\@themargin \vbox {%
687 <latexrelease> \setbox\@tempboxa \vbox to\headheight{%
688 <latexrelease> \vfil
689 <latexrelease> \color@hbox
690 <latexrelease> \normalcolor
691 <latexrelease> \hb@xt@\textwidth{\@thehead}%
692 <latexrelease> \color@endbox
693 <latexrelease> }%
694 <latexrelease> \dp\@tempboxa \z@
695 <latexrelease> \box\@tempboxa
696 <latexrelease> \vskip \headsep
697 <latexrelease> \box\@outputbox
698 <latexrelease> \baselineskip \footskip
699 <latexrelease> \color@hbox
700 <latexrelease> \normalcolor
701 <latexrelease> \hb@xt@\textwidth{\@thefoot}%
702 <latexrelease> \color@endbox
703 <latexrelease> }%
704 <latexrelease> }%
705 <latexrelease> \global\let\if@newlist\@if@newlist
706 <latexrelease> \global \colht \textheight
707 <latexrelease> \stepcounter{page}%
708 <latexrelease> \let\firstmark\botmark
709 <latexrelease>}
710 <latexrelease>\EndIncludeInRelease
711 (*2ekernel)

```

(End definition for \@outputpage, \@shipoutsetup, and \@writesetup.)

**\@begindvi** This unboxes stuff that must appear before anything else in the .dvi file, then returns that box register to the free list and cancels itself.

The stuff in the box should not add any typeset material to the page.

```

712 \def \@begindvi{%
713   \unvbox \@begindvibox
714   \global\let \@begindvi \@empty
715 }

```

(End definition for \@begindvi.)

`\@combinefloats` The `\boxmaxdepth` setting here was not made local to a box so was dangerous. It is needed only within the box made by `\@cflt` (and not normally even there), so it has been moved there; this also agrees with the original pseudocode.

```

716 \def \@combinefloats {%
717 %   \boxmaxdepth \maxdepth
718   \ifx \@toplist\@empty \else \@cflt \fi
719   \ifx \@botlist\@empty \else \@cflb \fi
720 }

721 \def \@cflt{%
722   \let \@elt \@comflelt
723   \setbox\@tempboxa \vbox{}%
724   \@toplist
725   \setbox\@outputbox \vbox{%
726                                   \boxmaxdepth \maxdepth
727                                   \unvbox\@tempboxa
728                                   \vskip -\floatsep
729                                   \topfigrule
730                                   \vskip \textfloatsep
731                                   \unvbox\@outputbox
732                                   }%
733   \let\@elt\relax
734   \xdef\@freelist{\@freelist\@toplist}%
735   \global\let\@toplist\@empty
736 }

737 \def \@cflb {%
738   \let\@elt\@comflelt
739   \setbox\@tempboxa \vbox{}%
740   \@botlist
741   \setbox\@outputbox \vbox{%
742                                   \unvbox\@outputbox
743                                   \vskip \textfloatsep
744                                   \botfigrule
745                                   \unvbox\@tempboxa
746                                   \vskip -\floatsep
747                                   }%
748   \let\@elt\relax
749   \xdef\@freelist{\@freelist\@botlist}%
750   \global \let \@botlist\@empty
751 }

```

*(End definition for \@combinefloats, \@cflt, and \@cflb.)*

```

\@comflelt
\@comdblfelet
\@combinedblfloats
752 \def\@comflelt#1{\setbox\@tempboxa
753     \vbox{\unvbox\@tempboxa\box #1\vskip\floatsep}}
754 \def\@comdblfelet#1{\setbox\@tempboxa
755     \vbox{\unvbox\@tempboxa\box #1\vskip\dblfloatsep}}
756 \def \@combinedblfloats{%
757   \ifx \@dbltoplist \@empty
758   \else
759     \setbox\@tempboxa \vbox{}%
760     \let \@elt \@comdblfelet

```

```

761 \dbltoplist
762 \let \@elt \relax
763 \xdef \@freelist {\@freelist\@dbltoplist}%
764 \global\let \@dbltoplist \empty
765 \setbox\@outputbox \vbox to\textheight

```

The setting of `\boxmaxdepth` here has no effect since the `\@outputbox` should already have depth zero. Even so, it would have no effect on the layout of the page.

```

766 {\boxmaxdepth\maxdepth %% probably not needed, CAR
767 \unvbox\@tempboxa\vskip-\dblfloatsep

```

Here we need different typesetting if the top float comes from `\@topnewpage`.

```

768 \ifnum \@dbltopnum>\m@ne
769 \dblfigrule
770 \fi
771 \vskip \dbltextfloatsep

```

If pdf links are present in the galley and those links get broken across pages they have to end up being on the same level of boxing (even if not actually in the same structure) due to some engine restrictions in pdf<sub>TEX</sub> and Lua<sub>TEX</sub>. We therefore unbox `\@outputbox` here (which only contains a single `\hbox`) so that this case has the same boxing level as a normal twocolumn page without top floats.

```

772 \unvbox\@outputbox
773 }%
774 \fi
775 }
776 \endkernel

```

(End definition for `\comflelt`, `\comdblflelt`, and `\combinedblfloats`.)

`\@startcolumn` We could combine (most of) these two into `\@startcol <list>`. Note that `\@xstartcol` was only used once (i.e. in `\@startcolumn`); it has therefore been removed. This is not quite as efficient but it now has the same structure as `\@startdblcolumn`.

The empty-list test has been moved to `\@tryfcolumn`.

```

777 \*2kernel | fltrace)
778 \def \@startcolumn {%
779 \global \@colroom \@colht
780 \@tryfcolumn \@deferlist
781 \if@fcolmade
782 \*trace)
783 \fl@trace{PAGE: float \if@twocolumn column \else page \fi
784 completed}%
785 \end{trace}
786 \else
787 \begin{group}
788 \let \reserved@b \@deferlist
789 \global \let \@deferlist \empty
790 \let \@elt \@scolelt
791 \reserved@b
792 \end{group}
793 \fi
794 }

```

This one does not need to set \@colht.

```

795 </2ekernel | fltrace>
796 <latexrelease | fltrace>\IncludeInRelease{2015/01/01}%
797 <latexrelease | fltrace> {\@startdblcolumn}{float order in 2-column}%
798 <*2ekernel | latexrelease | fltrace>
799 \def \@startdblcolumn {%
800   \@tryfcolumn \@deferlist
801   \if@fcolmade
802 <fltrace> \fl@trace{PAGE: double float page completed}%
803   \else
804     \begingroup
805       \let \reserved@b \@deferlist
806       \global \let \@deferlist \@empty
807       \let \@elt \@sdblcolelt
808       \reserved@b
809     \endgroup
810   \fi
811 }%
812 </2ekernel | latexrelease | fltrace>
813 <latexrelease | fltrace>\EndIncludeInRelease
814 <latexrelease | fltrace>\IncludeInRelease{0000/00/00}%
815 <latexrelease | fltrace> {\@startdblcolumn}{float order in 2-column}%
816 <latexrelease | fltrace>\def \@startdblcolumn {%

```

Not needed since this always comes after \@outputpage:

```

817 <latexrelease | fltrace>% \global \@colht \textheight
818 <latexrelease | fltrace> \@tryfcolumn \@dbldeferlist
819 <latexrelease | fltrace> \if@fcolmade
820 <*trace>
821 <latexrelease | fltrace> \fl@trace{PAGE: double float page completed}%
822 </trace>
823 <latexrelease | fltrace> \else
824 <latexrelease | fltrace> \begingroup
825 <latexrelease | fltrace> \let \reserved@b \@dbldeferlist
826 <latexrelease | fltrace> \global \let \@dbldeferlist \@empty
827 <latexrelease | fltrace> \let \@elt \@sdblcolelt
828 <latexrelease | fltrace> \reserved@b
829 <latexrelease | fltrace> \endgroup
830 <latexrelease | fltrace> \fi
831 <latexrelease | fltrace>}%
832 <latexrelease | fltrace>\EndIncludeInRelease
833 <*2ekernel | fltrace>

```

*(End definition for \@startcolumn and \@startdblcolumn.)*

\@tryfcolumn Now tests if its list is empty before any further exertion.

```

834 \def \@tryfcolumn #1{%
835   \global \@fcolmadefalse
836   \ifx #1\@empty
837     \else
838 <*trace>
839   \fl@trace{PAGE: try float \if@twocolumn column/page\else page\fi
840     ---\string #1}%

```



```

841     \fl@trace{----- \string #1: #1}%
842 \trace>

843     \xdef\@trylist{#1}%
844     \global \let \@failedlist \@empty
845     \begingroup
846     \let \@elt \@xtryfc \@trylist
847     \endgroup
848     \if@fcolmade
849     \vtryfc #1%
850     \fi
851 \fi
852 }
853 \endkernel | fltrace)

(End definition for \@tryfccolumn.)

854 \endkernel)

\@scolelt

855 \def\@scolelt#1{\def\@currbox{#1}\@addtonextcol}

(End definition for \@scolelt.)

\@sdblcolelt

856 \def\@sdblcolelt#1{\def\@currbox{#1}\@addtodblcol}

(End definition for \@sdblcolelt.)

\@vtryfc

857 \def\@vtryfc #1{%
858 \global\setbox\@outputbox\vbox{}%
859 \let\@elt\@wtryfc
860 \@flsucceed
861 \global\setbox\@outputbox \vbox to\@colht{%
862 \vskip \@fptop
863 \vskip -\@fpsep
864 \unvbox \@outputbox
865 \vskip \@fpbot}%
866 \let\@elt\relax
867 \xdef #1{\@failedlist\@flfail}%
868 \xdef\@freelist{\@freelist\@flsucceed}}

(End definition for \@vtryfc.)

\@wtryfc

869 \def\@wtryfc #1{%
870 \global\setbox\@outputbox\vbox{%
871 \unvbox\@outputbox
872 \vskip\@fpsep
873 \box #1}}

(End definition for \@wtryfc.)

```

\@xtryfc

```
874 </2ekernel>
875 <latexrelease>\IncludeInRelease{2015/01/01}{\@xtryfc}%
876 <latexrelease>                                     {float order in 2-column}%
877 <*2ekernel | latexrelease>
878 \def\@xtryfc #1{%
879   \@next\reserved@a\@trylist{}{}%
880   \@currtype \count #1%
881   \divide\@currtype\@xxxii
882   \multiply\@currtype\@xxxii
883   \@bitor \@currtype \@failedlist
884   \@testfp #1%
885   \@testwrongwidth #1%
886   \ifdim \ht #1>\@colht
887     \@testtrue
888   \fi
889   \if@test
890     \@cons\@failedlist #1%
891   \else
892     \@ytryfc #1%
893   \fi}%
894 </2ekernel | latexrelease>
895 <latexrelease>\EndIncludeInRelease
896 <latexrelease>\IncludeInRelease{0000/00/00}{\@xtryfc}%
897 <latexrelease>                                     {float order in 2-column}%
898 <latexrelease>\def\@xtryfc #1{%
899 <latexrelease>   \@next\reserved@a\@trylist{}{}%
900 <latexrelease>   \@currtype \count #1%
901 <latexrelease>   \divide\@currtype\@xxxii
902 <latexrelease>   \multiply\@currtype\@xxxii
903 <latexrelease>   \@bitor \@currtype \@failedlist
904 <latexrelease>   \@testfp #1%
905 <latexrelease>   \ifdim \ht #1>\@colht
906 <latexrelease>     \@testtrue
907 <latexrelease>   \fi
908 <latexrelease>   \if@test
909 <latexrelease>     \@cons\@failedlist #1%
910 <latexrelease>   \else
911 <latexrelease>     \@ytryfc #1%
912 <latexrelease>   \fi}%
913 <latexrelease>\EndIncludeInRelease
914 <*2ekernel>
```

(End definition for \@xtryfc.)

\@ytryfc

```
915 \def\@ytryfc #1{%
916   \begingroup
917   \gdef\@flsucceed{\@elt #1}%
918   \global\let\@flfail\@empty
919   \@tempdima\ht #1%
920   \let\@elt\@ztryfc
921   \@trylist
```

```

922 \ifdim \@tempdima >\@fpmin
923 \global\@fcolmadetrue
924 \else
925 \@cons\@failedlist #1%
926 \fi
927 \endgroup
928 \if@fcolmade
929 \let\@elt\@gobble
930 \fi}

```

(End definition for \@ytryfc.)

\@ztryfc

```

931 </2ekernel>
932 <latexrelease>\IncludeInRelease{2015/01/01}{@ztryfc}%
933 <latexrelease> {float order in 2-column}%
934 <*2ekernel | latexrelease>
935 \def\@ztryfc #1{%
936 \@tempcnta\count #1%
937 \divide\@tempcnta\@xxxii
938 \multiply\@tempcnta\@xxxii
939 \@bitor \@tempcnta {\@failedlist \@flfail}%
940 \@testfp #1%
941 not in fixfloats?
942 \@testwrongwidth #1%
943 \@tempdimb\@tempdima
944 \advance\@tempdimb\ht #1%
945 \advance\@tempdimb\@fpsep
946 \ifdim \@tempdimb >\@colht
947 \@testtrue
948 \fi
949 \if@test
950 \@cons\@flfail #1%
951 \else
952 \@cons\@flsucceed #1%
953 \@tempdima\@tempdimb
954 \fi}%
955 </2ekernel | latexrelease>
956 <latexrelease>\EndIncludeInRelease
957 <latexrelease>\IncludeInRelease{0000/00/00}{@ztryfc}%
958 <latexrelease> {float order in 2-column}%
959 <latexrelease>\def\@ztryfc #1{%
960 <latexrelease> \@tempcnta \count#1%
961 <latexrelease> \divide\@tempcnta\@xxxii
962 <latexrelease> \multiply\@tempcnta\@xxxii
963 <latexrelease> \@bitor \@tempcnta {\@failedlist \@flfail}%
964 <latexrelease> \@testfp #1%
965 <latexrelease> \@tempdimb\@tempdima
966 <latexrelease> \advance\@tempdimb \ht#1%
967 <latexrelease> \advance\@tempdimb\@fpsep
968 <latexrelease> \ifdim \@tempdimb >\@colht
969 <latexrelease> \@testtrue
970 <latexrelease> \fi

```

```

970 <latexrelease> \if@test
971 <latexrelease> \@cons\@flfail #1%
972 <latexrelease> \else
973 <latexrelease> \@cons\@flsucceed #1%
974 <latexrelease> \@tempdima\@tempdimb
975 <latexrelease> \fi}%
976 <latexrelease>\EndIncludeInRelease

```

(End definition for \@ztryfc.)

The major changes for float suppression and the changes to the float mechanism to make it conform to the documentation are in these next macros.

\@addtobot Lots of changes.

```

977 <*2kernel|fltrace>
978 \def \@addtobot {%
979 <*trace>
980 \fl@trace{***Start addtobot}%
981 </trace>
982 \@getfpsbit 4\relax
983 <*trace>
984 \fl@trace{fpstype \ifodd \@tempcnta OK \else not \fi bot:
985 \the \@fpstype}%
986 </trace>
987 \ifodd \@tempcnta
988 \@flsetnum \@botnum
989 \ifnum \@botnum>\z@
990 \@tempswafalse
991 \@flcheckspace \@botroom \@botlist
992 \if@tempswa

```

This next line means that this page is produced with box 255 having depth zero, rather than the normal maxdepth: is this needed, useful?

```

993 \global \maxdepth \z@
994 \@flupdates \@botnum \@botroom \@botlist
995 <*trace>
996 \fl@trace{colroom (after-bot) = \the \@colroom}%
997 \fl@trace{colnum (after-bot) = \the \@colnum}%
998 \fl@trace{botnum (after-bot) = \the \@botnum}%
999 \fl@trace{***Success: bot}%
1000 </trace>
1001 \@inserttrue
1002 \fi
1003 <*trace>
1004 \else
1005 \fl@trace{Fail: botnum = \the \@botnum:
1006 fpstype \the \@fpstype=ORD?}%
1007 \ifnum \@fpstype<\sixt@n
1008 \fl@trace{ERROR: !b float not successful (addtobot)}%
1009 \fi
1010 </trace>
1011 \fi
1012 \fi
1013 }

```

(End definition for \@addtobot.)

\@addtotoporbot Lots of changes.

```
1014 \def \@addtotoporbot {%
1015 <*trace>
1016   \fl@trace{***Start addtotoporbot}%
1017 </trace>
1018   \@getfpsbit \tw@
1019 <*trace>
1020   \fl@trace{fpstype \ifodd \@tempcnta OK \else not \fi top:
1021                                           \the \@fpstype}%
1022 </trace>
1023   \ifodd \@tempcnta
1024     \flsetnum \@topnum
1025     \ifnum \@topnum>\z@
1026       \@tempwafalse
1027       \flcheckspace \@toproom \@toplist
1028       \if@tempswa
1029         \@bitor\@currtype{\@midlist\@botlist}%
1030 <*trace>
1031         \fl@trace{(mid+bot)list: \@midlist, \@botlist:
1032                     (addtotoporbot-before)}%
1033 </trace>
1034     \if@test
1035 <*trace>
1036     \fl@trace{type already on list: mid or bot---sent to addtobot}%
1037 </trace>
1038   \else
1039     \flupdates \@topnum \@toproom \@toplist
1040 <*trace>
1041     \fl@trace{colroom (after-top) = \the \@colroom}%
1042     \fl@trace{colnum (after-top) = \the \@colnum}%
1043     \fl@trace{topnum (after-top) = \the \@topnum}%
1044     \fl@trace{***Success: top}%
1045 </trace>
1046     \@inserttrue
1047     \fi
1048   \fi
1049 <*trace>
1050   \else
1051     \fl@trace{Fail: topnum = \the \@topnum: fpstype
1052                                           \the \@fpstype=ORD?}%
1053     \ifnum \@fpstype<\sixt@n
1054       \fl@trace{ERROR: !t float not successful (addtotoporbot)}%
1055     \fi
1056 </trace>
1057   \fi
1058   \fi
1059   \if@insert
1060   \else
1061 <*trace>
1062   \fl@trace{sent to addtobot (addtotoporbot)}%
1063 </trace>
1064   \@addtobot
1065   \fi
1066 }
```

```
1067 </2ekernel | fltrace>
```

```
(End definition for \@addtotoporbot.)
```

```
\@addtocurcol Lots of changes.
```

```
1068 <latexrelease | fltrace | flafter>\IncludeInRelease{2015/01/01}%
1069 <latexrelease | fltrace | flafter> {\@addtocurcol}{float order in 2-column}%
1070 <*2ekernel | latexrelease | fltrace | flafter>
1071 \def \@addtocurcol {%
1072 <*trace>
1073   \fl@trace{***Start addtocurcol}%
1074 </trace>
1075   \@insertfalse
1076   \@setfloattypecounts
1077   \ifnum \@fpstype=8
1078 <*trace>
1079     \fl@trace{fpstype !p only (addtocurcol): \the \@fpstype = 8?}%
1080 </trace>
1081   \else
1082     \ifnum \@fpstype=24
1083 <*trace>
1084     \fl@trace{fpstype p only (addtocurcol): \the \@fpstype = 24?}%
1085 </trace>
1086   \else
1087     \flsettextmin
```

This is a new adjustment which is quite a major change in functionality; but it implements the documentation. Note that \@reqcolroom will include the whole of the page-so-far, and hence includes \@textfloatsheight of floats, so before comparing it with \@textmin, we add this to \@textmin also.

```
1088 <*trace>
1089   \fl@trace{textfloatsheight (before) = \the \@textfloatsheight}%
1090 </trace>
1091   \advance \@textmin \@textfloatsheight
1092   \@reqcolroom \@pageht
```

This line must be removed since \@specialoutput changed.

```
1093 %       \advance \@reqcolroom \@pagedp
1094 <*trace>
1095   \fl@trace{textmin + textfloatsheight: \the \@textmin}%
1096   \fl@trace{page-so-far: \the \@reqcolroom}%
1097 </trace>
1098   \ifdim \@textmin>\@reqcolroom
1099     \@reqcolroom \@textmin
1100 <*trace>
1101     \fl@trace{ORD? textmin being used}%
1102 </trace>
1103   \fi
1104   \advance \@reqcolroom \ht\@currbox
1105 <*trace>
1106   \fl@trace{float size = \the \ht \@currbox (addtocurcol)}%
1107   \fl@trace{colroom = \the \@colroom (addtocurcol)}%
1108   \fl@trace{reqcolroom = \the \@reqcolroom (addtocurcol)}%
1109 </trace>
```

```

1110 \ifdim \@colroom>\@reqcolroom
1111 \@flsetnum \@colnum
1112 \ifnum \@colnum>\z@
1113 \@bitor\@currtype\@deferlist

```

We need to defer the float also if its width doesn't fit.

```

1114 \@testwrongwidth\@currbox
1115 < *trace>
1116 \fl@trace{deferlist: \@deferlist: (addtocurcol-before)}%
1117 < /trace>
1118 \if@test
1119 < *trace>
1120 \fl@trace{type already on list: defer (addtocurcol)}%
1121 < /trace>
1122 \else
1123 \@bitor\@currtype\@botlist
1124 < *trace>
1125 \fl@trace{botlist: \@botlist: (addtocurcol-before)}%
1126 < /trace>
1127 \if@test
1128 < *trace>
1129 \fl@trace{type already on list: bot---sent to addtobot}%
1130 < /trace>
1131 \@addtobot
1132 \else
1133 < *trace>
1134 \fl@trace{fpstype \ifodd \@tempcnta OK \else not \fi
1135 here: \the \@fpstype}%
1136 < /trace>
1137 \ifodd \count\@currbox
1138 \advance \@reqcolroom \intextsep
1139 \ifdim \@colroom>\@reqcolroom
1140 \global \advance \@colnum \m@ne
1141 \global \advance \@textfloatsheight \ht\@currbox

```

This may sometimes give an overestimate.

```

1142 \global \advance \@textfloatsheight 2\intextsep
1143 \@cons \@midlist \@currbox
1144 < *trace>
1145 \fl@trace{***Success: here}%
1146 \fl@trace{textfloatsheight (after-here) =
1147 \the \@textfloatsheight}%
1148 \fl@trace{colnum (after-here) = \the \@colnum}%
1149 < /trace>

```

CHANGE TO \@addtocurcol:

\penalty\z@ changed to \penalty\interlinepenalty so \samepage works properly with figure and table environments. (Changed 23 Oct 86)

There is also an \addpenalty\interlinepenalty above.

Since in 2e \samepage is no longer supported, these could be removed.

Although it is best to use \addvspace in case two h floats come together, this makes other spacing more difficult to adjust; whereas if a user specifies two h floats together then they can more easily get the spacing correct by ad hoc commands.

It is necessary to adjust for the addition of `\parskip` here in case the float is added between paragraphs (i.e. when in vertical mode).

If the nobreak switch is true we need to reset it and clear `\everypar` since the float may not reset the flag and cannot reset the `\everypar` globally.

Typesetting starts here (we are in vertical mode).

```

1150         \if@nobreak
1151             \nobreak
1152             \@nobreakfalse
1153             \everypar{}%
1154         \else
1155             \addpenalty \interlinepenalty
1156         \fi
1157         \vskip \intextsep
1158         \box\@currbox
1159         \penalty\interlinepenalty
1160         \vskip\intextsep
1161         \ifnum\outputpenalty <-\@Mii \vskip -\parskip\fi

```

Typesetting ends here.

```

1162         \outputpenalty \z@
1163         \@inserttrue
1164     < *trace >
1165         \else
1166             \fl@trace{Fail---no room at 2nd test of colroom
1167                 (addtocorcol \string\intextsep)}%
1168     < /trace >
1169         \fi
1170     \fi
1171     \if@insert
1172     \else

```

Next set of docstrip guards are a bit weird, essentially `\@addtotoporbot` ends up inside the kernel and the `fltrace` package and `\@addtobot` shows up in the `flafter` package. Guess that could have been done a bit more obvious :-)

```

1173 < *2ekernel | fltrace | latexrelease >
1174 < *trace >
1175         \fl@trace{not here: sent to addtotoporbot}%
1176 < /trace >
1177         \@addtotoporbot
1178 < /2ekernel | fltrace | latexrelease >
1179 < *!2ekernel&!fltrace&!latexrelease >
1180 < *trace >
1181         \fl@trace{not here: sent to addtobot}%
1182 < /trace >
1183         \@addtobot
1184 < /!2ekernel&!fltrace&!latexrelease >
1185         \fi
1186     \fi
1187 \fi
1188 < *trace >
1189     \else
1190         \fl@trace{Fail: colnum = \the \@colnum:
1191             fpstype \the \@fpstype=ORD?}%
1192         \ifnum \@fpstype<\sist@@n

```



```

1193         \fl@trace{ERROR: BANG float not successful (addtocurcol)}%
1194     \fi
1195 </trace>
1196     \fi
1197 <*trace>
1198     \else
1199         \fl@trace{Fail---no room: fl box ht: \the \ht \@currbox
1200             (addtocurcol)}%
1201 </trace>
1202     \fi
1203     \fi
1204     \fi
1205     \if@insert
1206     \else
1207         \@resetfps
1208 <*trace>
1209     \fl@trace{put on deferlist (addtocurcol)}%
1210 </trace>
1211     \@cons\@deferlist\@currbox
1212 <*trace>
1213     \fl@trace{deferlist: \@deferlist: (addtocurcol-after)}%
1214 </trace>
1215     \fi
1216 }%
1217 </2ekernel | latexrelease | fltrace | flafter>
1218 <latexrelease | fltrace | flafter>\EndIncludeInRelease
1219 <latexrelease | fltrace | flafter>\IncludeInRelease{0000/00/00}%
1220 <latexrelease | fltrace | flafter> {\@addtocurcol}{float order in 2-column}%
1221 <latexrelease | fltrace | flafter>\def \@addtocurcol {%
1222 <*trace>
1223 <latexrelease | fltrace | flafter> \fl@trace{***Start addtocurcol}%
1224 </trace>
1225 <latexrelease | fltrace | flafter> \insertfalse
1226 <latexrelease | fltrace | flafter> \setfloattypecounts
1227 <latexrelease | fltrace | flafter> \ifnum \@fpstype=8
1228 <*trace>
1229 <latexrelease | fltrace | flafter> \fl@trace{fpstype !p only (addtocurcol):
1230 <latexrelease | fltrace | flafter> \the \@fpstype = 8?}%
1231 </trace>
1232 <latexrelease | fltrace | flafter> \else
1233 <latexrelease | fltrace | flafter> \ifnum \@fpstype=24
1234 <*trace>
1235 <latexrelease | fltrace | flafter> \fl@trace{fpstype p only (addtocurcol):
1236 <latexrelease | fltrace | flafter> \the \@fpstype = 24?}%
1237 </trace>
1238 <latexrelease | fltrace | flafter> \else
1239 <latexrelease | fltrace | flafter> \@flsettextmin

```

This is a new adjustment which is quite a major change in functionality; but it implements the documentation. Note that `\@reqcolroom` will include the whole of the page-so-far, and hence includes `\@textfloatsheight` of floats, so before comparing it with `\@textmin`, we add this to `\@textmin` also.

```

1240 <*trace>
1241 <latexrelease | fltrace | flafter> \fl@trace{textfloatsheight (before) =

```

```

1242 <latexrelease | fltrace | flafter>                                \the \@textfloatsheight}%
1243 </trace>
1244 <latexrelease | fltrace | flafter>                                \advance \@textmin \@textfloatsheight
1245 <latexrelease | fltrace | flafter>                                \@reqcolroom \@pageht
This line must be removed since \@specialoutput changed.
1246 %                        \advance \@reqcolroom \@pagedp
1247 <*trace>
1248 <latexrelease | fltrace | flafter>                                \fl@trace{textmin + textfloatsheight:
1249 <latexrelease | fltrace | flafter>                                \the \@textmin}%
1250 <latexrelease | fltrace | flafter>                                \fl@trace{page-so-far: \the \@reqcolroom}%
1251 <latexrelease | fltrace | flafter>
1252 </trace>
1253 <latexrelease | fltrace | flafter>                                \ifdim \@textmin>\@reqcolroom
1254 <latexrelease | fltrace | flafter>                                \@reqcolroom \@textmin
1255 <*trace>
1256 <latexrelease | fltrace | flafter>                                \fl@trace{ORD? textmin being used}%
1257 </trace>
1258 <latexrelease | fltrace | flafter>                                \fi
1259 <latexrelease | fltrace | flafter>                                \advance \@reqcolroom \ht\@currbox
1260 <*trace>
1261 <latexrelease | fltrace | flafter>                                \fl@trace{float size =
1262 <latexrelease | fltrace | flafter>                                \the \ht \@currbox (addtocurcol)}%
1263 <latexrelease | fltrace | flafter>                                \fl@trace{colroom =
1264 <latexrelease | fltrace | flafter>                                \the \@colroom (addtocurcol)}%
1265 <latexrelease | fltrace | flafter>                                \fl@trace{reqcolroom =
1266 <latexrelease | fltrace | flafter>                                \the \@reqcolroom (addtocurcol)}%
1267 </trace>
1268 <latexrelease | fltrace | flafter>                                \ifdim \@colroom>\@reqcolroom
1269 <latexrelease | fltrace | flafter>                                \@flsetnum \@colnum
1270 <latexrelease | fltrace | flafter>                                \ifnum \@colnum>\z@
1271 <latexrelease | fltrace | flafter>                                \@bitor\@currtype\@deferlist
1272 <*trace>
1273 <latexrelease | fltrace | flafter>                                \fl@trace{deferlist:
1274 <latexrelease | fltrace | flafter>                                \@deferlist: (addtocurcol-before)}%
1275 </trace>
1276 <latexrelease | fltrace | flafter>                                \if@test
1277 <*trace>
1278 <latexrelease | fltrace | flafter>                                \fl@trace{type already on list:
1279 <latexrelease | fltrace | flafter>                                defer (addtocurcol)}%
1280 </trace>
1281 <latexrelease | fltrace | flafter>                                \else
1282 <latexrelease | fltrace | flafter>                                \@bitor\@currtype\@botlist
1283 <*trace>
1284 <latexrelease | fltrace | flafter>                                \fl@trace{botlist: \@botlist:
1285 <latexrelease | fltrace | flafter>                                (addtocurcol-before)}%
1286 </trace>
1287 <latexrelease | fltrace | flafter>                                \if@test
1288 <*trace>
1289 <latexrelease | fltrace | flafter>                                \fl@trace{type already on list:
1290 <latexrelease | fltrace | flafter>                                bot---sent to addtobot}%
1291 </trace>
1292 <latexrelease | fltrace | flafter>                                \@addtobot
1293 <latexrelease | fltrace | flafter>                                \else
1294 <*trace>

```

```

1295 <latexrelease | fltrace | flafter> \fl@trace{fpstype
1296 <latexrelease | fltrace | flafter> \ifodd \@tempcnta OK \else not \fi
1297 <latexrelease | fltrace | flafter> here: \the \@fpstype}%
1298 </trace>
1299 <latexrelease | fltrace | flafter> \ifodd \count\@currbox
1300 <latexrelease | fltrace | flafter> \advance \@reqcolroom \intextsep
1301 <latexrelease | fltrace | flafter> \ifdim \@colroom>\@reqcolroom
1302 <latexrelease | fltrace | flafter> \global \advance \@colnum \m@ne
1303 <latexrelease | fltrace | flafter> \global \advance
1304 <latexrelease | fltrace | flafter> \@textfloatsheight\ht\@currbox

```

This may sometimes give an overestimate.

```

1305 <latexrelease | fltrace | flafter> \global \advance
1306 <latexrelease | fltrace | flafter> \@textfloatsheight 2\intextsep
1307 <latexrelease | fltrace | flafter> \@cons \midlist \@currbox
1308 <*trace>
1309 <latexrelease | fltrace | flafter> \fl@trace{***Success: here}%
1310 <latexrelease | fltrace | flafter> \fl@trace{textfloatsheight
1311 <latexrelease | fltrace | flafter> (after-here) =
1312 <latexrelease | fltrace | flafter> \the \@textfloatsheight}%
1313 <latexrelease | fltrace | flafter> \fl@trace{colnum (after-here) =
1314 <latexrelease | fltrace | flafter> \the \@colnum}%
1315 </trace>

```

CHANGE TO \@addtocurcol:

\penalty\z@ changed to \penalty\interlinepenalty so \samepage works properly with figure and table environments. (Changed 23 Oct 86)

There is also an \addpenalty\interlinepenalty above.

Since in 2e \samepage is no longer supported, these could be removed.

Although it is best to use \addvspace in case two h floats come together, this makes other spacing more difficult to adjust; whereas if a user specifies two h floats together then they can more easily get the spacing correct by ad hoc commands.

It is necessary to adjust for the addition of \parskip here in case the float is added between paragraphs (i.e. when in vertical mode).

If the nobreak switch is true we need to reset it and clear \everypar since the float may not reset the flag and cannot reset the \everypar globally.

Typesetting starts here (we are in vertical mode).

```

1316 <latexrelease | fltrace | flafter> \if@nobreak
1317 <latexrelease | fltrace | flafter> \nobreak
1318 <latexrelease | fltrace | flafter> \@nobreakfalse
1319 <latexrelease | fltrace | flafter> \everypar{}%
1320 <latexrelease | fltrace | flafter> \else
1321 <latexrelease | fltrace | flafter> \addpenalty\interlinepenalty
1322 <latexrelease | fltrace | flafter> \fi
1323 <latexrelease | fltrace | flafter> \vskip \intextsep
1324 <latexrelease | fltrace | flafter> \box\@currbox
1325 <latexrelease | fltrace | flafter> \penalty\interlinepenalty
1326 <latexrelease | fltrace | flafter> \vskip\intextsep
1327 <latexrelease | fltrace | flafter> \ifnum\outputpenalty
1328 <latexrelease | fltrace | flafter> <-\@Mii \vskip
1329 <latexrelease | fltrace | flafter> -\parskip\fi

```

Typesetting ends here.

```

1330 <latexrelease | fltrace | flafter> \outputpenalty \z@

```

```

1331 <latexrelease | fltrace | flafter>                \@inserttrue
1332 <*trace>
1333 <latexrelease | fltrace | flafter>                \else
1334 <latexrelease | fltrace | flafter> \fl@trace{Fail---no room at 2nd test of colroom
1335 <latexrelease | fltrace | flafter>                (addtocurcol \string\intertextsep)}%
1336 </trace>
1337 <latexrelease | fltrace | flafter>                \fi
1338 <latexrelease | fltrace | flafter>                \fi
1339 <latexrelease | fltrace | flafter>                \if@insert
1340 <latexrelease | fltrace | flafter>                \else

```

Next set of docstrip guards are a bit weird, essentially \@addtotoporbot ends up inside the kernel and the fltrace package and \@addtotoporbot shows up in the flafter package. Guess that could have been done a bit more obvious :-)

```

1341 <*2ekernel | fltrace>
1342 <*trace>
1343 <latexrelease | fltrace | flafter> \fl@trace{not here: sent to addtotoporbot}%
1344 </trace>
1345 <latexrelease | fltrace | flafter>                \@addtotoporbot
1346 </2ekernel | fltrace>
1347 <*!2ekernel&!autoload&!fltrace>
1348 <*trace>
1349 <latexrelease | fltrace | flafter> \fl@trace{not here: sent to addtobot}%
1350 </trace>
1351 <latexrelease | fltrace | flafter>                \@addtobot
1352 </!2ekernel&!autoload&!fltrace>
1353 <latexrelease | fltrace | flafter>                \fi
1354 <latexrelease | fltrace | flafter>                \fi
1355 <latexrelease | fltrace | flafter>                \fi
1356 <*trace>
1357 <latexrelease | fltrace | flafter>                \else
1358 <latexrelease | fltrace | flafter> \fl@trace{Fail: colnum = \the \@colnum:
1359 <latexrelease | fltrace | flafter>                fpstype \the \@fpstype=ORD?}%
1360 <latexrelease | fltrace | flafter>                \ifnum \@fpstype<\sist@n
1361 <latexrelease | fltrace | flafter> \fl@trace{ERROR: BANG float not successful
1362 <latexrelease | fltrace | flafter>                (addtocurcol)}}%
1363 <latexrelease | fltrace | flafter>                \fi
1364 </trace>
1365 <latexrelease | fltrace | flafter>                \fi
1366 <*trace>
1367 <latexrelease | fltrace | flafter>                \else
1368 <latexrelease | fltrace | flafter> \fl@trace{Fail---no room: fl box ht:
1369 <latexrelease | fltrace | flafter>                \the \ht \@currbox (addtocurcol)}}%
1370 </trace>
1371 <latexrelease | fltrace | flafter>                \fi
1372 <latexrelease | fltrace | flafter>                \fi
1373 <latexrelease | fltrace | flafter>                \fi
1374 <latexrelease | fltrace | flafter>                \if@insert
1375 <latexrelease | fltrace | flafter>                \else
1376 <latexrelease | fltrace | flafter>                \@resetfps
1377 <*trace>
1378 <latexrelease | fltrace | flafter> \fl@trace{put on deferlist (addtocurcol)}}%
1379 </trace>
1380 <latexrelease | fltrace | flafter>                \@cons\@deferlist\@currbox

```

```

1381 <*trace>
1382 <latexrelease | fltrace | flafter>      \fl@trace{deferlist: \@deferlist:
1383 <latexrelease | fltrace | flafter>      (addtocurcol-after)}}%
1384 </trace>
1385 <latexrelease | fltrace | flafter>      \fi
1386 <latexrelease | fltrace | flafter>      }%
1387 <latexrelease | fltrace | flafter>\EndIncludeInRelease

(End definition for \@addtocurcol.)

```

\@addtonextcol Lots of changes.

```

1388 <latexrelease | fltrace>\IncludeInRelease{2015/01/01}
1389 <latexrelease | fltrace>  {\@addtonextcol}{float order in 2-column}%
1390 <*2ekernel | latexrelease | fltrace>
1391 \def\@addtonextcol{%
1392   \begingroup
1393   <*trace>
1394   \fl@trace{***Start addtonextcol}%
1395   </trace>
1396   \@insertfalse
1397   \@setfloattypecounts
1398   \ifnum \@fpstype=8
1399   <*trace>
1400   \fl@trace{fpstype not curcol: \the \@fpstype = 8?}%
1401   </trace>
1402   \else
1403   \ifnum \@fpstype=24
1404   <*trace>
1405   \fl@trace{fpstype not curcol: \the \@fpstype = 24?}%
1406   </trace>
1407   \else
1408   \@flsettextmin
1409   <*trace>
1410   \fl@trace{text-so-far: Opt (top of col)}}%
1411   </trace>
1412   \@reqcolroom \ht\@currbox
1413   <*trace>
1414   \fl@trace{float size: \the \@reqcolroom (addtonextcol)}}%
1415   </trace>
1416   \advance \@reqcolroom \@textmin
1417   <*trace>
1418   \fl@trace{colroom = \the \@colroom (addtonextcol)}}%
1419   \fl@trace{reqcolroom = \the \@reqcolroom (addtonextcol)}}%
1420   </trace>
1421   \ifdim \@colroom>\@reqcolroom
1422   \@flsetnum \@colnum
1423   \ifnum \@colnum>\z@
1424   \@bitor\@currtype\@deferlist
1425   <*trace>
1426   \fl@trace{deferlist: \@deferlist: (addtonextcol-before)}}%
1427   </trace>
1428   \@testwrongwidth\@currbox
1429   \if@test

```

```

1430 <*trace>
1431         \fl@trace{type already on list: defer (addtonextcol)}%
1432 </trace>
1433         \else
1434 <*trace>
1435         \fl@trace{sent to addtotoporbot (addtonextcol)}%
1436 </trace>
1437         \@addtotoporbot
1438     \fi
1439 \fi
1440 <*trace>
1441     \else
1442         \fl@trace{Fail---no room: fl box ht: \the \ht \@currbox
1443                                     (addtonextcol)}%
1444 </trace>
1445     \fi
1446 \fi
1447 \fi
1448 \if@insert
1449 \else
1450 <*trace>
1451     \fl@trace{put back on deferlist (addtonextcol)}%
1452 </trace>
1453     \@cons\@deferlist\@currbox
1454 <*trace>
1455     \fl@trace{deferlist: \@deferlist: (addtonextcol-after)}%
1456 </trace>
1457 \fi
1458 <*trace>
1459     \fl@trace{End of addtonextcol -- locally counts:}%
1460     \fl@trace{col: \the\@colnum. top: \the \@topnum. bot: \the \@botnum.}%
1461 </trace>
1462 \endgroup
1463 <*trace>
1464     \fl@trace{End of addtonextcol -- globally counts:}%
1465     \fl@trace{col: \the\@colnum. top: \the \@topnum. bot: \the \@botnum.}%
1466 </trace>
1467 }%
1468 </2ekernel | latexrelease | fltrace>
1469 <latexrelease | fltrace>\EndIncludeInRelease
1470 <latexrelease | fltrace>\IncludeInRelease{0000/00/00}%
1471 <latexrelease | fltrace> {\@addtonextcol}{float order in 2-column}%
1472 <latexrelease | fltrace>\def\@addtonextcol{%
1473 <latexrelease | fltrace> \begingroup
1474 <*trace>
1475 <latexrelease | fltrace> \fl@trace{***Start addtonextcol}%
1476 </trace>
1477 <latexrelease | fltrace> \@insertfalse
1478 <latexrelease | fltrace> \@setfloattypescounts
1479 <latexrelease | fltrace> \ifnum \@fpstype=8
1480 <*trace>
1481 <latexrelease | fltrace> \fl@trace{fpstype not curcol:
1482 <latexrelease | fltrace> \the \@fpstype = 8?}%
1483 </trace>

```

```

1484 <latexrelease | fltrace> \else
1485 <latexrelease | fltrace> \ifnum \@fpstype=24
1486 <*trace>
1487 <latexrelease | fltrace> \fl@trace{fpstype not curcol:
1488 <latexrelease | fltrace> \the \@fpstype = 24?}%
1489 </trace>
1490 <latexrelease | fltrace> \else
1491 <latexrelease | fltrace> \@flsettextmin
1492 <*trace>
1493 <latexrelease | fltrace> \fl@trace{text-so-far: Opt (top of col)}%
1494 </trace>
1495 <latexrelease | fltrace> \@reqcolroom \ht\@currbox
1496 <*trace>
1497 <latexrelease | fltrace> \fl@trace{float size:
1498 <latexrelease | fltrace> \the \@reqcolroom (addtonextcol)}%
1499 <latexrelease | fltrace>
1500 </trace>
1501 <latexrelease | fltrace> \advance \@reqcolroom \@textmin
1502 <*trace>
1503 <latexrelease | fltrace> \fl@trace{colroom =
1504 <latexrelease | fltrace> \the \@colroom (addtonextcol)}%
1505 <latexrelease | fltrace> \fl@trace{reqcolroom =
1506 <latexrelease | fltrace> \the \@reqcolroom (addtonextcol)}%
1507 </trace>
1508 <latexrelease | fltrace> \ifdim \@colroom>\@reqcolroom
1509 <latexrelease | fltrace> \@flsetnum \@colnum
1510 <latexrelease | fltrace> \ifnum \@colnum>\z@
1511 <latexrelease | fltrace> \@bitor\@currtype\@deferlist
1512 <*trace>
1513 <latexrelease | fltrace> \fl@trace{deferlist: \@deferlist:
1514 <latexrelease | fltrace> (addtonextcol-before)}%
1515 </trace>
1516 <latexrelease | fltrace> \if@test
1517 <*trace>
1518 <latexrelease | fltrace> \fl@trace{type already on list:
1519 <latexrelease | fltrace> defer (addtonextcol)}%
1520 </trace>
1521 <latexrelease | fltrace> \else
1522 <*trace>
1523 <latexrelease | fltrace> \fl@trace{sent to addtotoporbot
1524 <latexrelease | fltrace> (addtonextcol)}%
1525 </trace>
1526 <latexrelease | fltrace> \@addtotoporbot
1527 <latexrelease | fltrace> \fi
1528 <latexrelease | fltrace> \fi
1529 <*trace>
1530 <latexrelease | fltrace> \else
1531 <latexrelease | fltrace> \fl@trace{Fail---no room: fl box ht:
1532 <latexrelease | fltrace> \the \ht \@currbox (addtonextcol)}%
1533 </trace>
1534 <latexrelease | fltrace> \fi
1535 <latexrelease | fltrace> \fi
1536 <latexrelease | fltrace> \fi
1537 <latexrelease | fltrace> \if@insert

```

```

1538 <latexrelease | fltrace> \else
1539 <*trace>
1540 <latexrelease | fltrace> \fl@trace{put back on deferlist
1541 <latexrelease | fltrace> (addtonextcol)}}%
1542 </trace>
1543 <latexrelease | fltrace> \@cons\@deferlist\@currbox
1544 <*trace>
1545 <latexrelease | fltrace> \fl@trace{deferlist: \@deferlist:
1546 <latexrelease | fltrace> (addtonextcol-after)}}%
1547 </trace>
1548 <latexrelease | fltrace> \fi
1549 <*trace>
1550 <latexrelease | fltrace> \fl@trace{End of addtonextcol --
1551 <latexrelease | fltrace> locally counts:}%
1552 <latexrelease | fltrace> \fl@trace{col: \the \@colnum.
1553 <latexrelease | fltrace> top: \the \@topnum. bot: \the \@botnum.}%
1554 </trace>
1555 <latexrelease | fltrace> \endgroup
1556 <*trace>
1557 <latexrelease | fltrace> \fl@trace{End of addtonextcol --
1558 <latexrelease | fltrace> globally counts:}%
1559 <latexrelease | fltrace> \fl@trace{col: \the \@colnum.
1560 <latexrelease | fltrace> top: \the \@topnum. bot: \the \@botnum.}%
1561 </trace>
1562 <latexrelease | fltrace>}%
1563 <latexrelease | fltrace>\EndIncludeInRelease

(End definition for \@addtonextcol.)

```

\@addtodblcol Lots of changes.

```

1564 <latexrelease | fltrace>\IncludeInRelease{2015/01/01}%
1565 <latexrelease | fltrace> {\@addtodblcol}{float order in 2-column}%
1566 <*2ekernel | latexrelease | fltrace>
1567 \def\@addtodblcol{%
1568 \begingroup
1569 <*trace>
1570 \fl@trace{***Start addtodblcol}%
1571 </trace>
1572 \@insertfalse
1573 \@setfloattypecounts
1574 \@getfpsbit \tw@
1575 <*trace>
1576 \fl@trace{fpstype \ifodd \@tempcnta OK \else not \fi dbltop:
1577 \the \@fpstype}%
1578 </trace>
1579 \ifodd\@tempcnta
1580 \flsetnum \@dbltopnum
1581 \ifnum \@dbltopnum>\z@
1582 \tempswafalse
1583 \ifdim \@dbltoproom>\ht\@currbox
1584 \tempswatrue
1585 <*trace>
1586 \fl@trace{Space OK: \@dbltoproom =
1587 \the \@dbltoproom > \the \ht \@currbox

```



```

1588                                     (dbltoproom)}}%
1589 </trace>
1590 \else
1591 <*trace>
1592     \fl@trace{fpstype: \the \@fpstype (addtodblcol)}}%
1593 </trace>
1594     \ifnum \@fpstype<\sixt@@n
1595 <*trace>
1596         \fl@trace{BANG float ignoring \@dbltoproom}%
1597         \fl@trace{\@spaces \@dbltoproom = \the \@dbltoproom.
1598             Ht float: \the \ht \@currbox-BANG}%
1599 </trace>

Need to check that there is room on the page, using the local value of \@textmin to make
the necessary adjustment to \@dbltoproom.

1600     \advance \@dbltoproom \@textmin
1601 <*trace>
1602     \fl@trace{Local value of texmin: \the \@textmin}%
1603     \fl@trace{\@spaces space on page = \the \@dbltoproom.
1604         Ht float: \the \ht \@currbox-BANG}%
1605 </trace>
1606     \ifdim \@dbltoproom>\ht \@currbox
1607         \@tempswatrue
1608 <*trace>
1609         \fl@trace{Space OK BANG: space on page =
1610             \the \@dbltoproom > \the \ht \@currbox}%
1611     \else
1612         \fl@trace{fpstype: \the \@fpstype}%
1613         \fl@trace{Fail---no room dbltoproom-BANG?:}%
1614         \fl@trace{\@spaces space on page = \the \@dbltoproom.
1615             Ht float: \the \ht \@currbox}%
1616 </trace>
1617     \fi
1618     \advance \@dbltoproom -\@textmin
1619 <*trace>
1620     \else
1621         \fl@trace{fpstype: \the \@fpstype}%
1622         \fl@trace{Fail---no room dbltoproom-ORD?:}%
1623         \fl@trace{\@spaces \@dbltoproom = \the \@dbltoproom.
1624             Ht float: \the \ht \@currbox}%
1625 </trace>
1626     \fi
1627     \fi
1628     \if@tempswa
1629         \@bitor \@currtype \@deferlist
1630 <*trace>
1631         \fl@trace{(dbl)deferlist: \@deferlist: (before)}%
1632 </trace>
        not in fixfloats?
1633         \@testwrongwidth\@currbox
1634         \if@test
1635 <*trace>
1636             \fl@trace{type already on list: (dbl)defer}%

```

```

1637 </trace>
1638         \else
1639             \@tempdima -\ht\@currbox
1640             \advance\@tempdima
1641                 -\ifx \@dbltoplist\@empty \dbltextfloatsep \else
1642                     \dblfloatsep \fi
1643             \global \advance \@dbltoproom \@tempdima
1644             \global \advance \@colht \@tempdima
1645             \global \advance \@dbltopnum \m@ne
1646             \@cons \@dbltoplist \@currbox
1647 <*trace>
1648             \fl@trace{dbltopnum (after) = \the \@dbltopnum}%
1649             \fl@trace{***Success: dbltop}%
1650 </trace>
1651             \@inserttrue
1652         \fi
1653     \fi
1654 <*trace>
1655     \else
1656         \fl@trace{Fail: dbltopnum = \the \@dbltopnum: fpstype
1657             \the \@fpstype=ORD?}%
1658         \ifnum \@fpstype<\sist@n
1659             \fl@trace{ERROR: !t float not successful (addtodblcol)}%
1660         \fi
1661 </trace>
1662     \fi
1663     \fi
1664     \if@insert
1665     \else
1666 <*trace>
1667     \fl@trace{put on deferlist}%
1668 </trace>
1669     \@cons\@deferlist\@currbox
1670 <*trace>
1671     \fl@trace{(dbl)deferlist: \@deferlist: (after)}%
1672 </trace>
1673     \fi
1674 <*trace>
1675     \fl@trace{End of addtodblcol -- locally count:}%
1676     \fl@trace{ dbltop: \the \@dbltopnum.}%
1677 </trace>
1678     \endgroup
1679 <*trace>
1680     \fl@trace{End of addtodblcol -- globally count:}%
1681     \fl@trace{dbltop: \the \@dbltopnum.}%
1682 </trace>
1683 }%
1684 </2ekernel | latexrelease | fltrace>
1685 <latexrelease | fltrace>\EndIncludeInRelease
1686 <latexrelease | fltrace>\IncludeInRelease{0000/00/00}%
1687 <latexrelease | fltrace> {\@addtodblcol}{float order in 2-column}%
1688 <latexrelease | fltrace>\def\@addtodblcol{%
1689 <latexrelease | fltrace> \begingroup
1690 <*trace>

```

```

1691 <latexrelease | fltrace> \fl@trace{***Start addtodblcol}%
1692 </trace>
1693 <latexrelease | fltrace> \@insertfalse
1694 <latexrelease | fltrace> \@setfloattypecounts
1695 <latexrelease | fltrace> \@getfpsbit \tw@
1696 <*trace>
1697 <latexrelease | fltrace> \fl@trace{fpstype \ifodd \@tempcnta OK
1698 <latexrelease | fltrace> \else not \fi dbltop: \the \@fpstype}%
1699 </trace>
1700 <latexrelease | fltrace> \ifodd\@tempcnta
1701 <latexrelease | fltrace> \@flsetnum \@dbltopnum
1702 <latexrelease | fltrace> \ifnum \@dbltopnum>\z@
1703 <latexrelease | fltrace> \@tempswafalse
1704 <latexrelease | fltrace> \ifdim \@dbltoproom>\ht\@currbox
1705 <latexrelease | fltrace> \@tempswatrue
1706 <*trace>
1707 <latexrelease | fltrace> \fl@trace{Space OK: \@dbltoproom =
1708 <latexrelease | fltrace> \the \@dbltoproom > \the \ht \@currbox
1709 <latexrelease | fltrace> (dbltoproom)}%
1710 </trace>
1711 <latexrelease | fltrace> \else
1712 <*trace>
1713 <latexrelease | fltrace> \fl@trace{fpstype: \the \@fpstype (addtodblcol)}%
1714 </trace>
1715 <latexrelease | fltrace> \ifnum \@fpstype<\sixt@@n
1716 <*trace>
1717 <latexrelease | fltrace> \fl@trace{BANG float ignoring \@dbltoproom}%
1718 <latexrelease | fltrace> \fl@trace{\@spaces \@dbltoproom =
1719 <latexrelease | fltrace> \the \@dbltoproom.
1720 <latexrelease | fltrace> Ht float: \the \ht \@currbox-BANG}%
1721 </trace>

```

Need to check that there is room on the page, using the local value of \@textmin to make the necessary adjustment to \@dbltoproom.

```

1722 <latexrelease | fltrace> \advance \@dbltoproom \@textmin
1723 <*trace>
1724 <latexrelease | fltrace> \fl@trace{Local value of texmin: \the\@textmin}%
1725 <latexrelease | fltrace> \fl@trace{\@spaces space on page =
1726 <latexrelease | fltrace> \the \@dbltoproom.
1727 <latexrelease | fltrace> Ht float: \the \ht \@currbox-BANG}%
1728 </trace>
1729 <latexrelease | fltrace> \ifdim \@dbltoproom>\ht\@currbox
1730 <latexrelease | fltrace> \@tempswatrue
1731 <*trace>
1732 <latexrelease | fltrace> \fl@trace{Space OK BANG: space on page =
1733 <latexrelease | fltrace> \the\@dbltoproom > \the\ht\@currbox}%
1734 <latexrelease | fltrace> \else
1735 <latexrelease | fltrace> \fl@trace{fpstype: \the \@fpstype}%
1736 <latexrelease | fltrace> \fl@trace{Fail---no room dbltoproom-BANG?:}%
1737 <latexrelease | fltrace> \fl@trace{\@spaces space on page =
1738 <latexrelease | fltrace> \the \@dbltoproom.
1739 <latexrelease | fltrace> Ht float: \the \ht \@currbox}%
1740 </trace>
1741 <latexrelease | fltrace> \fi

```

```

1742 <latexrelease | fltrace>          \advance \@dbltoproom -\@textmin
1743 <*trace>
1744 <latexrelease | fltrace>          \else
1745 <latexrelease | fltrace>          \fl@trace{fpstype: \the \@fpstype}%
1746 <latexrelease | fltrace>          \fl@trace{Fail---no room dbltoproom-ORD?:}%
1747 <latexrelease | fltrace>          \fl@trace{\@spaces \@dbltoproom =
1748 <latexrelease | fltrace>          \the \@dbltoproom.
1749 <latexrelease | fltrace>          Ht float: \the \ht \@currbox}%
1750 </trace>
1751 <latexrelease | fltrace>          \fi
1752 <latexrelease | fltrace>          \fi
1753 <latexrelease | fltrace>          \if@tempswa
1754 <latexrelease | fltrace>          \@bitor \@currtype \@dbldeferlist
1755 <*trace>
1756 <latexrelease | fltrace>          \fl@trace{dbldeferlist:
1757 <latexrelease | fltrace>          \@dbldeferlist: (before)}%
1758 </trace>
1759 <latexrelease | fltrace>          \if@test
1760 <*trace>
1761 <latexrelease | fltrace>          \fl@trace{type already on list: dbldefer}%
1762 </trace>
1763 <latexrelease | fltrace>          \else
1764 <latexrelease | fltrace>          \@tempdima -\ht\@currbox
1765 <latexrelease | fltrace>          \advance\@tempdima
1766 <latexrelease | fltrace>          -\ifx \@dbltoplist\@empty
1767 <latexrelease | fltrace>          \dbltextfloatsep
1768 <latexrelease | fltrace>          \else \dblfloatsep \fi
1769 <latexrelease | fltrace>          \global \advance \@dbltoproom \@tempdima
1770 <latexrelease | fltrace>          \global \advance \@colht \@tempdima
1771 <latexrelease | fltrace>          \global \advance \@dbltopnum \m@ne
1772 <latexrelease | fltrace>          \@cons \@dbltoplist \@currbox
1773 <*trace>
1774 <latexrelease | fltrace>          \fl@trace{dbltopnum (after) =
1775 <latexrelease | fltrace>          \the \@dbltopnum}%
1776 <latexrelease | fltrace>          \fl@trace{***Success: dbltop}%
1777 </trace>
1778 <latexrelease | fltrace>          \@inserttrue
1779 <latexrelease | fltrace>          \fi
1780 <latexrelease | fltrace>          \fi
1781 <*trace>
1782 <latexrelease | fltrace>          \else
1783 <latexrelease | fltrace>          \fl@trace{Fail: dbltopnum = \the \@dbltopnum:
1784 <latexrelease | fltrace>          fpstype \the \@fpstype=ORD?}%
1785 <latexrelease | fltrace>          \ifnum \@fpstype<\sist@n
1786 <latexrelease | fltrace>          \fl@trace{ERROR: !t float not successful
1787 <latexrelease | fltrace>          (addtodblcol)}%
1788 <latexrelease | fltrace>          \fi
1789 </trace>
1790 <latexrelease | fltrace>          \fi
1791 <latexrelease | fltrace>          \fi
1792 <latexrelease | fltrace>          \if@insert
1793 <latexrelease | fltrace>          \else
1794 <*trace>
1795 <latexrelease | fltrace>          \fl@trace{put on dbldeferlist}%

```

```

1796 </trace>
1797 <latexrelease | fltrace> \@cons\@dbldeferlist\@currbox
1798 <*trace>
1799 <latexrelease | fltrace> \fl@trace{dbldeferlist: \@dbldeferlist: (after)}%
1800 </trace>
1801 <latexrelease | fltrace> \fi
1802 <*trace>
1803 <latexrelease | fltrace> \fl@trace{End of addtodblcol -- locally count:}%
1804 <latexrelease | fltrace> \fl@trace{ dbltop: \the \@dbltopnum.}%
1805 </trace>
1806 <latexrelease | fltrace> \endgroup
1807 <*trace>
1808 <latexrelease | fltrace> \fl@trace{End of addtodblcol -- globally count:}%
1809 <latexrelease | fltrace> \fl@trace{dbltop: \the \@dbltopnum.}%
1810 </trace>
1811 <latexrelease | fltrace>}%
1812 <latexrelease | fltrace>\EndIncludeInRelease

```

(End definition for \@addtodblcol.)

\@addmarginpar

```

1813 <*2ekernel>
1814 \def\@addmarginpar{\@next\@marbox\@currlist{\@cons\@freelist\@marbox
1815 \@cons\@freelist\@currbox}\@latexbug\@tempcnta\@ne
1816 \if@twocolumn
1817 \if@firstcolumn \@tempcnta\m@ne \fi
1818 \else
1819 \if@mparswitch
1820 \ifodd\c@page \else\@tempcnta\m@ne \fi
1821 \fi
1822 \if@reversemargin \@tempcnta -\@tempcnta \fi
1823 \fi
1824 \ifnum\@tempcnta <\z@ \global\setbox\@marbox\box\@currbox \fi
1825 \@tempdima\@mparbottom
1826 \advance\@tempdima -\@pageht
1827 \advance\@tempdima\ht\@marbox
1828 \ifdim\@tempdima >\z@
1829 \@latex@warning@no@line {Marginpar on page \thepage\space moved}%
1830 \else
1831 \@tempdima\z@
1832 \fi
1833 \global\@mparbottom\@pageht
1834 \global\advance\@mparbottom\@tempdima
1835 \global\advance\@mparbottom\dp\@marbox
1836 \global\advance\@mparbottom\marginparpush
1837 \advance\@tempdima -\ht\@marbox

Putting box movement inside the ‘marbox’:
1838 \global\setbox \@marbox
1839 \vbox {\vskip \@tempdima
1840 \box \@marbox}%
1841 \global \ht\@marbox \z@
1842 \global \dp\@marbox \z@

```

Sticking (rather than gluing;-) the ‘marbox’ to the line above, changed vskip to kern:

```

1843 \kern -\@pagedp
1844 \nointerlineskip
1845 \hb@xt@\columnwidth
1846 {\ifnum \@tempcnta >\z@
1847   \hskip\columnwidth \hskip\marginparsep
1848   \else
1849     \hskip -\marginparsep \hskip -\marginparwidth
1850   \fi
1851   \box\@marbox \hss}%

```

For this reason the following code can vanish:

```

\ nobreak          %% No longer needed.  CAR92/12
\ vskip -\@tempdima  %% No longer needed.  CAR92/12

1852 \nointerlineskip
1853 \hbox{\vrule \@height\z@ \@width\z@ \@depth\@pagedp}}

```

*(End definition for \@addmarginpar.)*

### 1.1.1 Kludgeins

This part of the file is part of the implementation of the following two new commands for L<sup>A</sup>T<sub>E</sub>X2<sub>ε</sub>.

`\enlargethispage{<dim>}`

Adds <dim> to the height of the current column only. On the printed page the bottom of this column is extended downwards by exactly <dim> without having any effect on the placement of the footer; this may result in an overprinting.

`\enlargethispage*{<dim>}`

Similar to `\enlargethispage` but it tries to squeeze the column to be printed in as small a space as possible, ie it uses any shrinkability in the column. If the column was not explicitly broken (e.g. with `\pagebreak`) this may result in an overfull box message but except for this it will come out as expected (if you know what to expect).

The star form of this command is dedicated to Leslie Lamport, the other we need for ourselves (FMi, CAR).

These commands may well have unwanted effects if used soon before a `\clearpage`: please give keep them clear of such places.

`\@kludgeins` The insert which makes T<sub>E</sub>X do a lot of the necessary work. All we need to put into it is the amount by which the pagegoal should be changed.

```

1854 \newinsert \@kludgeins
1855 \global\dimen\@kludgeins \maxdimen
1856 \global\count\@kludgeins 1000

```

*(End definition for \@kludgeins.)*

`\enlargethispage` The user command.

```

\enlargethispage* 1857 \gdef \enlargethispage {%
1858     \ifstar
1859     {%
1860     \*trace)
1861         \fl@trace{Enlarging page height * }%
1862     \*trace)
1863         \@enlargepage{\hbox{\kern\p@}}}%
1864     {%
1865     \*trace)
1866         \fl@trace{Enlarging page height exactly---}%
1867     \*trace)
1868         \@enlargepage\@empty}%
1869 }

(End definition for \enlargethispage and \enlargethispage*.)

```

`\@enlargepage` This actually inserts the insert, after checking for extreme values of the change.

```

1870 \gdef\@enlargepage#1#2{%
1871 \*trace)
1872     \fl@trace{\@spaces\@spaces by #2}%
1873 \*trace)
1874     \@tempkipa#2\relax
1875     \ifdim \@tempkipa>.5\maxdimen
1876         \@latex@error{Suggested\space extra\space height\space
1877             (\the\@tempkipa)\space dangerously\space
1878             large}\@eha
1879     \else
1880         \ifdim \vsize<.5\maxdimen
1881     \*trace)
1882         \fl@trace {Kludgeins added--pagegoal before: \the\pagegoal}%
1883     \*trace)
1884         \@bsphack
1885         \insert\@kludgeins{#1\vskip-\@tempkipa}%
1886         \@esphack

This next bit is for tracing only:
1887 \*trace)
1888     \ifvmode \par
1889         \fl@trace {Kludgeins added--pagegoal after: \the \pagegoal}%
1890     \fi
1891 \*trace)
1892     \else
1893         \@latex@error{Page\space height\space already\space
1894             too\space large}\@eha
1895     \fi
1896     \fi
1897 }

(End definition for \@enlargepage.)

```

`\ShowFloat` This command provides some information about the contents of a float register. Float registers have internal names of the form `\bx@{Uppercase-letter(s)-or numbers}` and you specify just this letter or letters as the argument, e.g., `\ShowFloat{A}`. (There is not much error recovery if you specify something that isn't a float.)

```

1898 </2ekernel>
1899 <*2ekernel | latexrelease>
1900 <latexrelease>\IncludeInRelease{2021/11/15}%
1901 <latexrelease>          {\ShowFloat}{Show float register contents}%
1902 \def\ShowFloat#1{\begingroup
1903   \let \fl@trace \fl@tracemessage
1904   \fl@trace{***Float #1 details:}%
1905   \ifcsname bx@#1\endcsname
1906     \expandafter\fl@ShowFloat\csname bx@#1\endcsname
1907   \else
1908     \fl@trace{Not a float!}%
1909   \fi
1910 \endgroup
1911 }
1912 \def\fl@ShowFloat#1{%
1913   \fl@traceval{\count#1}% % this here should be interpreted on day
1914   \fl@traceval{\ht#1}%
1915   \fl@traceval{\dp#1}%
1916   \fl@traceval{\wd#1}%
1917   {\tracingonline1\showboxbreadth10\showboxdepth3\showbox#1}%
1918 }

```

Here are two definitions from `fltrace` that make the above code work:

```

1919 \def \fl@traceval #1{\fl@trace{\string #1 = \the #1}}
1920 \def \fl@tracemessage #1{{\let\@elt\@empty\typeout{LaTeX2e: #1}}}
1921 </2ekernel | latexrelease>
1922 <latexrelease>\EndIncludeInRelease
1923 <latexrelease>\IncludeInRelease{0000/00/00}%
1924 <latexrelease>          {\ShowFloat}{Show float register contents}%
1925 <latexrelease>
1926 <latexrelease>\let\ShowFloat\@undefined
1927 <latexrelease>\let\fl@ShowFloat\@undefined
1928 <latexrelease>\let\fl@traceval\@undefined
1929 <latexrelease>\let\fl@tracemessage\@undefined
1930 <latexrelease>\EndIncludeInRelease

```

*(End definition for \ShowFloat.)*

### 1.1.2 Float control

This part implements controllable floats and other changes to the float mechanism.

It provides, at the document level, the following command for inclusion in  $\text{\LaTeX}2\epsilon$ .

`\suppressfloats`

This suppresses all further floats on the current page.

With an optional argument it suppresses only floats only in certain positions on the current page.

[t] suppresses only floats at the top of the page [b] suppresses only floats at the bottom of the page

It also enables the use of an extra specifier, `!`, in the location optional argument of a float. If this is present then, just for this particular float, whenever it is processed by the float mechanism the following are ignored:



- all restrictions on the number of floats which can appear;
- all explicit restrictions on the amount of space which should (not) be occupied by floats and/or text.

The mechanism will still attempt to ensure that pages are not overfull.

These specifiers override, for the single float, the suppression commands described above.

In its current form, it also supplies a reasonably exhaustive, and somewhat baroque, means of tracing some aspects of the float mechanism.

More tracing.

```

\fl@trace Set-up tracing for floats independent of other tracing as it produces mega-output. Default
\tracefloatsoff is no tracing.
\tracefloats 1931 <*\fltrace>
\fl@traceval 1932 \def \fl@tracemessage #1{{\let\@elt\@empty\typeout{LaTeX2e: #1}}}
\tracefloatvals 1933 \def \tracefloats{\let \fl@trace \fl@tracemessage}
\fl@tracemessage 1934 \def \tracefloatsoff {\let \fl@trace \@gobble}
1935 \tracefloatsoff
1936 \def \fl@traceval #1{\fl@trace{\string #1 = \the #1}}
1937 \IncludeInRelease{2015/01/01}{\tracefloatvals}%
1938 {trace float vals}%
1939 \def \tracefloatvals{%

```

As `\@dblfloatplacement` sets `\f@depth` it needs to be run inside a group, otherwise the float placement will test for the wrong value.<sup>49</sup>

```
1940 \begingroup
```

When the user requests `\tracefloatvals` then they should show regardless of the tracing state, so locally we make sure that it is activated.

```

1941 \tracefloats
1942 \@dblfloatplacement
1943 \@floatplacement
1944 \fl@trace{***Float placement parameters:}%
1945 \fl@traceval\@colnum
1946 \fl@traceval\@colroom
1947 \fl@traceval\@topnum
1948 \fl@traceval\@toproom
1949 \fl@traceval\@botnum
1950 \fl@traceval\@botroom
1951 \fl@traceval\@fpmin
1952 \fl@trace{\string\textfraction = \textfraction}%
1953 \fl@traceval\@dbltopnum
1954 \fl@traceval\@dbltoproom
1955 \fl@trace{\string\textfraction = \textfraction}%
1956 \fl@trace{toplist: \@toplist}%
1957 \fl@trace{botlist: \@botlist}%
1958 \fl@trace{midlist: \@midlist}%
1959 \fl@trace{deferlist: \@deferlist}%
1960 \fl@trace{dbltoplist: \@dbltoplist}%
1961 %Fmi \fl@trace{dbldeferlist: \@dbldeferlist}%
1962 \endgroup

```

---

<sup>49</sup>This is a somewhat questionable design.

```

1963 }
1964 \EndIncludeInRelease
1965 \IncludeInRelease{0000/00/00}{\tracefloatvals}%
1966 {trace float vals}%
1967 \def \tracefloatvals{%
1968 \begingroup
1969 \tracefloats
1970 \@dblfloatplacement
1971 \@floatplacement
1972 \fl@trace{***Float placement parameters:}%
1973 \fl@traceval\@colnum
1974 \fl@traceval\@colroom
1975 \fl@traceval\@topnum
1976 \fl@traceval\@toproom
1977 \fl@traceval\@botnum
1978 \fl@traceval\@botroom
1979 \fl@traceval\@fpmin
1980 \fl@trace{\string\textfraction = \textfraction}%
1981 \fl@traceval\@dbltopnum
1982 \fl@traceval\@dbltoproom
1983 \fl@trace{\string\textfraction = \textfraction}%
1984 \fl@trace{toplist: \@toplist}%
1985 \fl@trace{botlist: \@botlist}%
1986 \fl@trace{midlist: \@midlist}%
1987 \fl@trace{deferlist: \@deferlist}%
1988 \fl@trace{dbltoplist: \@dbltoplist}%
1989 % next line only in old releases
1990 \fl@trace{dbldeferlist: \@dbldeferlist}%
1991 \endgroup
1992 }
1993 \EndIncludeInRelease

```

We need to make sure that `fltrace` comes before `flafter` to make the tracing work.

```

1994 \@ifpackageloaded{flafter}
1995 {\PackageWarningNoLine
1996 {fltrace}{Load 'fltrace' before 'flafter'\MessageBreak
1997 Attempting to recover by reloading 'flafter'}}%
Hide the fact that flafter was already loaded and then request it anew.
1998 \expandafter\let\csname ver@flafter.sty\endcsname\relax
1999 \def\reserved@a#1{%
2000 \expandafter\let\csname\string#1+flafter+IIR\endcsname\relax}%
2001 \reserved@a\@addtocurcol
2002 \reserved@a\@addtonextcol
2003 \RequirePackage{flafter}}{}
2004 \fltrace

```

As the code for `flafter` will contain tracing calls so that it works in conjunction with `fltrace` we need to provide a dummy definition for `\fl@trace` in that package.

```

2005 \flafter
2006 \providecommand\fl@trace[1]{}
2007 \flafter

```

(End definition for `\fl@trace` and others.)

`\suppressfloats` Float suppression commands: these set the relevant counter globally to zero. Thus they  
`\@flstop` are overridden for a particular float by an `!` specifier.

```
2008 <*2ekernel>
2009 \def \suppressfloats {%
2010   \@ifnextchar [%
2011     \@flstop
2012     {\global \@colnum \z@}%
2013 }
```

Maybe this should be a loop over `#1`?

```
2014 \def \@flstop [#1]{%
2015   \if t#1%
2016     \global \@topnum \z@
2017   \fi
2018   \if b#1%
2019     \global \@botnum \z@
2020   \fi
2021 }
```

(End definition for `\suppressfloats` and `\@flstop`.)

Manipulation of float placement and type; both their strings and the corresponding count registers.

`\@fpstype` First a new count register to go with `\@currtype`.

`\@reqcolroom` Then a new skip register, for information needed to remove the `\@maxsep` conservatism: it is possible that this could use a temporary register.

`\@textfloatsheight` Finally a dimension register to hold the total height of in-text floats on the current page. This is needed to implement a major change in the functionality of `\@addtocurcol` which is, nevertheless, a bug fix. It is not local and therefore cannot be a temporary register.

```
2022 \newcount \@fpstype
2023 \newdimen \@reqcolroom
2024 \newdimen \@textfloatsheight
2025 </2ekernel>
```

(End definition for `\@fpstype`, `\@reqcolroom`, and `\@textfloatsheight`.)

`\@fpsadddefault` Adds the default placement to what is already there.

Should not need to change this, but could do it as follows:

```
def \@fpsadddefault {%
  \@temptokena \expandafter\expandafter\expandafter
    {\csname fps@ \@captype \endcsname}%
  \edef \reserved@a {\the \@temptokena}%
  \@onelevel@sanitize \reserved@a
  \edef \@fps {\@fps\reserved@a}%
}
```

```
2026 <*2ekernel | fltrace>
2027 \def \@fpsadddefault {%
2028 <*trace>
2029   \fl@trace{fps changed from: \@fps}%
2030 </trace>
```

```

2031 \edef \@fps {\@fps\csname fps@\@capttype \endcsname}%
2032 \@latex@warning {%
2033   No positions in optional float specifier.\MessageBreak
2034   Default added (so using '\@fps')}%
2035 }

```

*(End definition for \@fpsadddefault.)*

**\@setfloattypecounts** Sets counters \@fpstype and \@currtype.

BANG == bit4 of \count\@currbox = 0.

```

2036 \def \@setfloattypecounts {%
2037   \@currtype \count\@currbox
2038   \@fpstype \count\@currbox
2039   \divide\@currtype\@xxxii \multiply\@currtype\@xxxii
2040   \advance \@fpstype -\@currtype
2041   (*trace)
2042   \fl@trace{(mod 32) fpstype: \the \@fpstype}%
2043   \fl@trace{(mult of 32) currtype: \the \@currtype}%
2044   % Tracing only: but some should be changed into real errors/warnings?
2045   \ifnum \@fpstype<\sist@n
2046     \ifnum \@fpstype=\z@
2047       \fl@trace{ERROR: no PLACEMENT, fpstype = \the \@fpstype = 0?}%
2048     \fi
2049     \ifnum \@fpstype=\@ne
2050       \fl@trace{WARNING: only h, fpstype = \the \@fpstype = 1?}%
2051     \fi
2052     \fl@trace{BANG float}%
2053   \else
2054     \ifnum \@fpstype=\sist@n
2055       \fl@trace{ERROR: no PLACEMENT, fpstype = \the \@fpstype = 16?}%
2056     \fi
2057     \ifnum \@fpstype=17
2058       \fl@trace{WARNING: only h, fpstype = \the \@fpstype = 17?}%
2059     \fi
2060     \fl@trace{ORD float}%
2061   \fi
2062   /trace)
2063 }
2064 /2ekernel | fltrace)

```

*(End definition for \@setfloattypecounts.)*

Macros for getting, testing and setting bits of the fps.

**\@getfpsbit** Sets \@tempcnta to required bit of \count\@currbox.

```

2065 (*2ekernel)
2066 \def \@getfpsbit {%
2067   \@boxfpsbit \@currbox
2068 }

```

*(End definition for \@getfpsbit.)*

**\@boxfpsbit** Used above.

```

2069 \def \@boxfpsbit #1#2{%
2070   \@tempcnta \count#1%
2071   \divide \@tempcnta #2\relax
2072 }

```

(End definition for \@boxfpsbit.)

**\@testfp** New definition of the float page test.

```
2073 \def \@testfp #1{%
2074   \@boxfpsbit #1\relax % Really ‘#1 8’ for human readers!
2075   \ifodd \@tempcnta
2076   \else
2077     \@testtrue
2078   \fi
2079 }
```

(End definition for \@testfp.)

**\@setfpsbit** Sets required bit of \@tempcnta (to 1).

```
2080 \def \@setfpsbit #1{%
2081   \@tempcntb \@tempcnta
2082   \divide \@tempcntb #1\relax
2083   \ifodd \@tempcntb
2084   \else
2085     \advance \@tempcnta #1\relax
2086   \fi
2087 }
2088 </2ekernel>
```

(End definition for \@setfpsbit.)

**\@resethfps** Globally adds t as a possible location for an h or !h only placement: this must be done using the count.

Although it will leave \@fpstype set to 17 even if it was originally 1, this does not matter since it is the last thing in \@addtocurcol.

```
2089 <*2ekernel | fltrace>
2090 \def \@resethfps {%
2091   \let\reserved@a\@empty
2092   \ifnum \@fpstype=\@ne
2093     \def \reserved@a {!}%
2094     \@fpstype 17
2095   \fi
2096   \ifnum \@fpstype=17
2097     \global \advance \count\@currbox \tw@
2098     \@latex@warning@no@line {%
2099       ‘\reserved@a h’ float specifier changed to ‘\reserved@a ht’}%
2100 <*trace>
2101     \fl@trace{%
2102       ‘t’ added to ‘\reserved@a h’- new Count: \the \count\@currbox}%
2103 </trace>
2104   \fi
2105 }
```

(End definition for \@resethfps.)

Special stuff for BANG floats.

`\@flsetnum` Ignores any zero float counter value in case BANG.

It uses a local assignment to the normally global counter: a bit naughty, perhaps?

These assignments are safe so long as the counter involved is only consulted once (i.e. only for the ‘bang float’) with the changed value. This is the case within `\@addtocurcol` because it is used only once within a call of the output routine (which forms a group).

For `\@addtonextcol` this is achieved by putting a group around its code; this is needed because it is called (by `\@startcolumn`) for each float which was on the deferlist. Almost identical considerations pertain to `\@addtodblcol`. There may be more efficient ways to handle this, but the group seems to be the simplest.

```

2106 \def \@flsetnum #1{%
2107   <*trace>
2108   \fl@trace{fpstype: \the \@fpstype (flsetnum \string#1)}%
2109   </trace>
2110   \ifnum \@fpstype<\sist@n
2111     \ifnum #1=\z@
2112     <*trace>
2113       \fl@trace{BANG float resetting \string#1 to 1}%
2114     </trace>
2115     #1\@ne
2116   \fi
2117   \fi
2118   <*trace>
2119   \fl@trace{#1 (before) = \the #1}%
2120   </trace>
2121 }

```

*(End definition for \@flsetnum.)*

`\@flsettextmin` This ignores `\textfraction` space restriction in case BANG.

```

2122 \def \@flsettextmin {%
2123   <*trace>
2124   \fl@trace{fpstype: \the \@fpstype (flsettextmin)}%
2125   </trace>
2126   \ifnum \@fpstype<\sist@n
2127   <*trace>
2128     \fl@trace{BANG ignoring textmin}%
2129   </trace>
2130   \@textmin \z@
2131   \else
2132     \@textmin \textfraction\@colht
2133   <*trace>
2134     \fl@trace{ORD textmin = \the \@textmin}%
2135   </trace>
2136   \fi
2137 }

```

*(End definition for \@flsettextmin.)*

`\@flcheckspace` This ignores space restriction in case BANG; this is still slightly conservative since it does not allow for the fact that, if there is no text in the column then `\textfloatsep` is not needed. Sets `@tempswa` true if there is room for `\@currbox`.

```

2138 \def \@flcheckspace #1#2{%

```

```

2139 \advance \@reqcolroom
2140 \ifx #2\@empty \textfloatsep \else \floatsep \fi
2141 (*trace)
2142 \fl@trace{colroom = \the \@colroom
2143 (flcheckspace \string#1 \string#2)}%
2144 \fl@trace{reqcolroom = \the \@reqcolroom
2145 (flcheckspace \string#1 \string#2)}%
2146 (/trace)
2147 \ifdim \@colroom>\@reqcolroom
2148 \ifdim #1>\ht\@currbox
2149 \@tempwattrue
2150 (*trace)
2151 \fl@trace{Space OK: #1 = \the #1 > \the \ht \@currbox
2152 (flcheckspace \string#1 \string#2)}%
2153 (/trace)
2154 \else
2155 (*trace)
2156 \fl@trace{fpstype: \the \@fpstype
2157 (flcheckspace \string#1 \string#2)}%
2158 (/trace)
2159 \ifnum \@fpstype<\sixt@n
2160 (*trace)
2161 \fl@trace{BANG float ignoring #1
2162 (flcheckspace \string#1 \string#2):}%
2163 \fl@trace{\@spaces #1 = \the #1. Ht float: \the \ht \@currbox
2164 BANG}%
2165 (/trace)
2166 \@tempwattrue
2167 (*trace)
2168 \else
2169 \fl@trace{Fail---no room (flcheckspace \string#1 \string#2)
2170 (fpstype \the \@fpstype=ORD?):}%
2171 \fl@trace{\@spaces #1 = \the #1. Ht float: \the \ht \@currbox
2172 ORD?}%
2173 (/trace)
2174 \fi
2175 \fi
2176 (*trace)
2177 \else
2178 \fl@trace{Fail---no room at 2nd test of colroom
2179 (flcheckspace \string#1 \string#2)}%
2180 (/trace)
2181 \fi
2182 }
2183 (/2ekernel | fltrace)

```

(End definition for \@flcheckspace.)

**\@flupdates** This updates everything when a float is placed.

```

2184 (*2ekernel)
2185 \def \@flupdates #1#2#3{%
2186 \global \advance #1\m@ne
2187 \global \advance \@colnum \m@ne
2188 \@tempdima -\ht\@currbox

```

```

2189 \advance \@tempdima
2190 -\ifx #3\@empty \textfloatsep \else \floatsep \fi
2191 \global \advance #2\@tempdima
2192 \global \advance \@colroom \@tempdima
2193 \@cons #3\@currbox
2194 }
2195 </2ekernel>

```

(End definition for `\flupdates`.)

Interesting facts about float mechanisms past and present, together with a summary of various features, some unresolved:

1. The value `\textfraction` does not affect the processing of doublecol floats: this seems sensible, but should be documented.
2. `\twocolumn floatplacement` was wrong: `dbl` not needed, `ord` needed.
3. `\floatplacement` was not called after `\startdblcol` or `\topnewpage`. This has been changed; it is clearly a bug fix.
4. The use `\topnewpage` when `\dblfigrule` is non-trivial produced a rule in the wrong place. This has been fixed by not using `\dblfigrule` when processing the ‘float’ from `\topnewpage`.
5. If the specifier was just `h` and the float could not be put here, it went on the deferlist and stayed there until a `clearpage`. It now gets changed to a ‘th’: this is only an error-recovery action, putting just `h` or `!h` should be deprecated.
6. `\dblmaxsep` was ‘the maximum of `\dblfloatsep` and `\dbltextfloatsep`’. But it was never used! Now gone completely, like `\maxsep`.
7. After an `h` float is put on a page, it was counted as text when applying the `\textfraction` test; this is possibly too big a change although it is a bug fix?
8. Two consecutive `h` floats are separated by twice `\intertextsep`: this could be changed to one by use of `\addvspace`, OK? Note that it would also mean that less space is put in if an `h` float immediately follows other spaces. This is also possibly too big a change, at least for compatibility mode? Or it may be simply wrong! It has not been changed.
9. Now `\addtocurcol` checks first for just `p` fps. I think that this is an increase in efficiency, but maybe the coding should be made even more efficient.
10. `\@tryfcolumn` now tests if the list is empty first, otherwise lots of wasted time! Thus this test has been removed from `\startcolumn`. As Frank pointed out, this makes `\startcolumn` less efficient. But it is now the same as `\startdblcolumn`: I can see no reason why they should be different, but which is best?
11. Why is `\colroom` set in `\doclearpage`?
12. Footnotes. Check what `\clearpage` does when footnotes are left over. Footnotes are not put on float pages and, also, `\addtonextcol` ignores the existence of held-over footnotes in deciding what floats can go on the page. Not changed.
13. `\clearpage` can still lose non-boxes, at least when floats are involved. It also moves some to the ‘wrong page’, but this may be a coding problem.



14. The `!` option makes it necessary to check in `\output` that there is enough room left on the page after adding a float. (This would have been necessary anyway if anyone set `\@textmin` too close to zero! A similar danger existed also if the text in a `\twocolumn[text]` entity gets too large.) The current implementation of this also makes the normal case a little less efficient, OK? Not enough room means, at present, less than `\baselineskip`, with a warning: is this OK? Should it be made generic (another parameter)?
15. There are four possibilities for supporting this:  
`\twocolumn[\maketitle more text]`  
 One is to change `\maketitle` slightly to allow this. Another is to change `\@topnewpage` so that more than one `\twocolumn[]` command is allowed; in this case `\maketitle\twocolumn[more text]` will work. The former is more robust from the user's viewpoint, but makes the code for `\maketitle` rather ad hoc (maybe it is already?). Another is to misuse the global `twocolumn` flag locally within `\@topnewpage`. Yet another is to move the column count register from the `multicol` package into the kernel. This has been done.
16. Where should the reinserts be put to maximise the probability that footnotes come out on the correct page? Or should we go for as much compatibility as possible (but see next item)?
17. Should we continue to support (as much as possible) `\samepage`? Some of its intended functionality is now advertised as being provided by `\enlargethispage`. Use of either is likely to result in wrongly placed footnotes, marginals, etc. Which should have priority: obeying the pagination instructions, or correct placement of notes/marginalia?
18. Is the adjustment of space to cause shrinking in the kludge-\* case correct? Should it be limited to 0pt?
19. Is the setting of `\boxmaxdepth` in `makecol` and friends needed? It only has any effect if `\@textbottom` ends with a box or rule, in which case the `vskip` to allow for its depth should also be added. If it is kept, it should probably be the last thing in the box. It has now been removed.  
 It would perhaps be better to document that `\@textbottom` and `\@texttop` must have natural height 0pt.
20. I cannot see why the `vskip` adjustment for the depth is needed if `boxmaxdepth` is used to ensure that there is never a too deep box.
21. The value of `\boxmaxdepth` should be explicitly set whenever necessary: it is too risky to assume that it has any particular value. Care is needed in deciding what to set it to.  
 It is interesting to note that the value of `\boxmaxdepth` is unique in being read before the local settings for the box group are reset; all other parameter settings which affect the box construction use their values outside the box group.
22. Should `\@maxdepth` store the setting of `\maxdepth` from `lplain`? Or should we provide a proper interface to class files for setting these?

An analysis of various other macros.

`\@opcol` should do `\@floatplacement`, but where? Right at the end, since it always occurs at the start of a column.

```
\def\@opcol{%
  % Why is this done first?
  \global \@mparbottom \z@
  \if@twocolumn
    \@outputdblcol
  \else
    \@outputpage
    % This is not needed since it is done at the end of
    %   |\@outputpage|:
    \global \@colht \textheight
  \fi}
```

Only tracing has been added to these.

```
2196 <latexrelease | fltrace>\IncludeInRelease{2017/01/01}%
2197 <latexrelease | fltrace> {\@makefcolumn}{negative height floats}%
2198 <*2ekernel | fltrace | latexrelease>
2199 \def\@makefcolumn #1{%
2200   \begingroup

2201   \@fpmin -\maxdimen

2202   \let \@testfp \@gobble
2203   \@tryfcolumn #1%
2204   \endgroup
2205   <*trace>
2206   \if@fcolmade
2207     \fl@trace{PAGE: in \string\clearpage
2208               \if@twocolumn ---twocolumn\fi---}%
2209     \fl@trace{----- float column/page completed from \string#1}%
2210     \fi
2211   </trace>
2212 }

2213 <latexrelease | fltrace>\EndIncludeInRelease
2214 <latexrelease | fltrace>\IncludeInRelease{0000/00/00}%
2215 <latexrelease | fltrace> {\@makefcolumn}{negative height floats}%
2216 <latexrelease | fltrace>\def\@makefcolumn #1{%
2217 <latexrelease | fltrace> \begingroup
2218 <latexrelease | fltrace>   \@fpmin \z@
2219 <latexrelease | fltrace>   \let \@testfp \@gobble
2220 <latexrelease | fltrace>   \@tryfcolumn #1%
2221 <latexrelease | fltrace> \endgroup
2222 <*trace>
2223 <latexrelease | fltrace> \if@fcolmade
2224 <latexrelease | fltrace>   \fl@trace{PAGE: in \string\clearpage
2225 <latexrelease | fltrace>               \if@twocolumn ---twocolumn\fi---}%
2226 <latexrelease | fltrace>   \fl@trace{----- float column/page completed
2227 <latexrelease | fltrace>               from \string#1}%
2228 <latexrelease | fltrace> \fi
2229 </trace>
```

```

2230 <latexrelease | fltrace>}
2231 <latexrelease | fltrace>\EndIncludeInRelease
2232 </2ekernel | fltrace | latexrelease>

```

This will line up the last baselines in the two columns provided they are constructed in the normal way: i.e. ending in a skip of minus the original depth, with `\@textbottom` adding nothing.

Thus again it is essential for `\@textbottom` to have depth 0pt.

```

2233 <latexrelease | fltrace>\IncludeInRelease{2015/01/01}%
2234 <latexrelease | fltrace> {\@outputdblcol}{2 column marks}%
2235 <*2ekernel | fltrace | latexrelease>

```

This is just a change to the single command `\@outputdblcol` so that it saves mark information for the first column and restores it in the second column.

```

2236 \def\@outputdblcol{%
2237   \if@firstcolumn
2238     \global\@firstcolumnfalse

```

Save the left column

```

2239   \global\setbox\@leftcolumn\copy\@outputbox
2240 <fltrace> \fl@trace{PAGE: first column boxed}%

```

Remember the marks from the first column

```

2241   \splitmaxdepth\maxdimen
2242   \vbadness\maxdimen

```

In case of `\enlargethispage` we will have infinite negative glue at the bottom of the page (coming from `\vss`) and that will earn us an error message if we `\vsplit` to get at the marks. So we need to remove the last glue (if any) at the end of `\@outputbox` as we are only interested in marks that change doesn't matter.

```

2243   \setbox\@outputbox\vbox{\unvbox\@outputbox\unskip}%
2244   \setbox\@outputbox\vsplit\@outputbox to\maxdimen

```

One minor difference from the current `fixmarks` package, pass the marks through a token register to stop any `#` tokens causing an error in a `\def`.

```

2245   \toks@\expandafter{\topmark}%
2246   \xdef\@firstcoltopmark{\the\toks@}%
2247   \toks@\expandafter{\splitfirstmark}%
2248   \xdef\@firstcolfirstmark{\the\toks@}%

```

This test does not work if truly empty marks have been inserted, but L<sup>A</sup>T<sub>E</sub>X marks should always have (at least) two brace groups. (Except before the first mark is used, when the marks are empty, but that is OK here.)

```

2249   \ifx\@firstcolfirstmark\@empty
2250     \global\let\@setmarks\relax
2251   \else
2252     \gdef\@setmarks{%
2253       \let\firstmark\@firstcolfirstmark
2254       \let\topmark\@firstcoltopmark}%
2255   \fi

```

End of change

```

2256   \else
2257     \global\@firstcolumntrue
2258     \setbox\@outputbox\vbox{%
2259       \hb@xt@\textwidth{%

```

```

2260         \hb@xt@\columnwidth{\box\@leftcolumn \hss}%
2261         \hfil
The color of the \vrule should be \normalcolor as to not inherit the color from the
column.
2262         {\normalcolor\vrule \@width\columnseprule}%
2263         \hfil
2264         \hb@xt@\columnwidth{\box\@outputbox \hss}}}%
2265 <fltrace>         \fl@trace{PAGE: second column also boxed}%
2266         \@combinedblfloats
Override current first and top with those of first column if necessary
2267         \@setmarks
End of change
2268         \@outputpage
2269 <fltrace>         \fl@trace{PAGE: two column page completed}%
2270         \begingroup
2271         \dblfloatplacement
2272         \@startdblcolumn
2273         \@whilesw\if@fcolmade \fi{\@outputpage
2274 <fltrace>         \fl@trace{PAGE: double float page completed}%
2275         \@startdblcolumn}%
2276         \endgroup
2277         \fi}%

2278 <latexrelease | fltrace>\EndIncludeInRelease
2279 <latexrelease | fltrace>\IncludeInRelease{0000/00/00}%
2280 <latexrelease | fltrace> {\@outputdblcol}{2 column marks}%
2281 <latexrelease | fltrace>\def\@outputdblcol{%
2282 <latexrelease | fltrace> \if@firstcolumn
2283 <latexrelease | fltrace> \global \@firstcolumnfalse
2284 <latexrelease | fltrace> \global \setbox\@leftcolumn \box\@outputbox
2285 <*trace>
2286 <latexrelease | fltrace> \fl@trace{PAGE: first column boxed}%
2287 </trace>
2288 <latexrelease | fltrace> \else
2289 <latexrelease | fltrace> \global \@firstcolumntrue
2290 <latexrelease | fltrace> \setbox\@outputbox \vbox {%
2291 <latexrelease | fltrace>         \hb@xt@\textwidth {%
2292 <latexrelease | fltrace>         \hb@xt@\columnwidth {%
2293 <latexrelease | fltrace>         \box\@leftcolumn \hss}%
2294 <latexrelease | fltrace>         \hfil
2295 <latexrelease | fltrace>         {\normalcolor\vrule
2296 <latexrelease | fltrace>         \@width\columnseprule}%
2297 <latexrelease | fltrace>         \hfil
2298 <latexrelease | fltrace>         \hb@xt@\columnwidth {%
2299 <latexrelease | fltrace>         \box\@outputbox \hss}%
2300 <latexrelease | fltrace>         }%
2301 <latexrelease | fltrace>         }%
2302 <*trace>
2303 <latexrelease | fltrace> \fl@trace{PAGE: second column also boxed}%
2304 </trace>
2305 <latexrelease | fltrace> \@combinedblfloats
2306 <latexrelease | fltrace> \@outputpage
2307 <*trace>

```

```

2308 <latexrelease | fltrace>    \fl@trace{PAGE: two column page completed}%
2309 </trace>
2310 <latexrelease | fltrace>    \begingroup
2311 <latexrelease | fltrace>    \@dblfloatplacement
2312 <latexrelease | fltrace>    \@startdblcolumn

```

This loop could be replaced by an `\expandafter` tail recursion in `\@startdblcolumn`.

```

2313 <latexrelease | fltrace>    \@whiles\if@fcolmade \fi
2314 <latexrelease | fltrace>    {\@outputpage
2315 <*trace>
2316 <latexrelease | fltrace>    \fl@trace{PAGE: double float page completed}%
2317 </trace>
2318 <latexrelease | fltrace>    \@startdblcolumn}%
2319 <latexrelease | fltrace>    \endgroup
2320 <latexrelease | fltrace>    \fi
2321 <latexrelease | fltrace>}%
2322 <latexrelease | fltrace>\EndIncludeInRelease
2323 </2ekernel | fltrace | latexrelease>

```

### 1.1.3 Float placement parameters

The main purpose of this section is to ensure that all the float-placement parameters which need to be set in a class file or package have been declared. It also describes their use and sets values for them which are reasonable for typical documents using US letter or A4 sized paper.

#### Limits for the placement of floating objects

**\c@topnumber** This counter holds the maximum number of floats that can appear at the top of a text page or column.

```

2324 <*2ekernel>
2325 \newcount\c@topnumber
2326 \setcounter{topnumber}{2}

```

(End definition for `\c@topnumber`.)

**\topfraction** This macro holds the maximum proportion (as a decimal number) of a text page or column that can be occupied by floats at the top.

```

2327 \newcommand\topfraction{.7}

```

(End definition for `\topfraction`.)

**\c@bottomnumber** This counter holds the maximum number of floats that can appear at the bottom of a text page or column.

```

2328 \newcount\c@bottomnumber
2329 \setcounter{bottomnumber}{1}

```

(End definition for `\c@bottomnumber`.)

**\bottomfraction** This macro holds the maximum proportion (as a decimal number) of a text page or column that can be occupied by floats at the bottom.

```

2330 \newcommand\bottomfraction{.3}

```

*(End definition for \bottomfraction.)*

**\c@totalnumber** This counter holds the maximum number of floats that can appear on any text page or column.

```
2331 \newcount\c@totalnumber
2332 \setcounter{totalnumber}{3}
```

*(End definition for \c@totalnumber.)*

**\textfraction** This macro holds the minimum proportion (as a decimal number) of a text page or column that must be occupied by text.

```
2333 \newcommand\textfraction{.2}
```

*(End definition for \textfraction.)*

**\floatpagefraction** This macro holds the minimum proportion (as a decimal number) of a page or column that must be occupied by floating objects before a ‘float page’ is produced.

```
2334 \newcommand\floatpagefraction{.5}
```

*(End definition for \floatpagefraction.)*

**\c@dbltopnumber** This counter holds the maximum number of double-column floats that can appear on the top of a two-column text page.

```
2335 \newcount\c@dbltopnumber
2336 \setcounter{dbltopnumber}{2}
```

*(End definition for \c@dbltopnumber.)*

**\dbltopfraction** This macro holds the maximum proportion (as a decimal number) of a two-column text page that can be occupied by double-column floats at the top.

```
2337 \newcommand\dbltopfraction{.7}
```

*(End definition for \dbltopfraction.)*

**\dblfloatpagefraction** This macro holds the minimum proportion (as a decimal number) of a page that must be occupied by double-column floating objects before a ‘double-column float page’ is produced.

```
2338 \newcommand\dblfloatpagefraction{.5}
```

*(End definition for \dblfloatpagefraction.)*

## Floats on a text page

`\floatsep` When a floating object is placed on a page with text, these parameters control the separation between the float and the other objects on the page. These parameters are used for both one-column mode and single-column floats in two-column mode. They are all rubber lengths.

`\floatsep` is the space between adjacent floats that are placed at the top or bottom of the text page or column.

`\textfloatsep` is the space between the main text and floats at the top or bottom of the page or column.

`\intextsep` is the space between in-text floats and the text.

```
2339 \newskip\floatsep
2340 \newskip\textfloatsep
2341 \newskip\intextsep
2342 \setlength\floatsep {12\p@ \@plus 2\p@ \@minus 2\p@}
2343 \setlength\textfloatsep{20\p@ \@plus 2\p@ \@minus 4\p@}
2344 \setlength\intextsep {12\p@ \@plus 2\p@ \@minus 2\p@}
```

*(End definition for `\floatsep`, `\textfloatsep`, and `\intextsep`.)*

`\dblfloatsep` When double-column floats (floating objects that span the whole `\textwidth`) are placed at the top of a text page in two-column mode, the separation between the float and the text is controlled by `\dblfloatsep` and `\dbltextfloatsep`. They are rubber lengths.

`\dblfloatsep` is the space between adjacent double-column floats placed at the top of the text page.

`\dbltextfloatsep` is the space between the main text and double-column floats at the top of the page.

```
2345 \newskip\dblfloatsep
2346 \newskip\dbltextfloatsep
2347 \setlength\dblfloatsep {12\p@ \@plus 2\p@ \@minus 2\p@}
2348 \setlength\dbltextfloatsep{20\p@ \@plus 2\p@ \@minus 4\p@}
```

*(End definition for `\dblfloatsep` and `\dbltextfloatsep`.)*

## Floats on their own page or column

`\@fptop` When floating objects are placed on a separate page or column, called a ‘float page’, the layout of the page is controlled by these parameters, which are rubber lengths.

`\@fpsep` At the top of the page `\@fptop` is inserted; typically this supplies some stretchable whitespace. At the bottom of the page `\@fpbot` is inserted. Between adjacent floats `\@fpsep` is inserted.

These parameters are used for all floating objects on a ‘float page’ in one-column mode, and for single-column floats in two-column mode.

Note that at least one of the two parameters `\@fptop` and `\@fpbot` should contain a `plus ...fil` so as to fill the remaining empty space.

```
2349 \newskip\@fptop
2350 \newskip\@fpsep
2351 \newskip\@fpbot
2352 \setlength\@fptop{0\p@ \@plus 1fil}
2353 \setlength\@fpsep{8\p@ \@plus 2fil}
2354 \setlength\@fpbot{0\p@ \@plus 1fil}
```

*(End definition for `\@fptop`, `\@fpsep`, and `\@fpbot`.)*

`\@dblftop` Double-column ‘float pages’ in two-column mode use similar parameters.

`\@dblpsep` 2355 `\newskip\@dblftop`

`\@dblpbot` 2356 `\newskip\@dblpsep`

2357 `\newskip\@dblpbot`

2358 `\setlength\@dblftop{0\p@ \@plus 1fil}`

2359 `\setlength\@dblpsep{8\p@ \@plus 2fil}`

2360 `\setlength\@dblpbot{0\p@ \@plus 1fil}`

*(End definition for \@dblftop, \@dblpsep, and \@dblpbot.)*

`\topfigrule` The macros can be used to put in rules between floats and text; whatever they insert

`\botfigrule` should be vertical mode material which takes up zero space.

`\dblfigrule` 2361 `\let\topfigrule=\relax`

2362 `\let\botfigrule=\relax`

2363 `\let\dblfigrule=\relax`

2364 `\</2ekernel>`

*(End definition for \topfigrule, \botfigrule, and \dblfigrule.)*



## File Z

# lthyphen.dtx

This file contains the code for loading hyphenation patterns into L<sup>A</sup>T<sub>E</sub>X. Most of this will end up in a file called `hyphen.ltx`. If you wish to customize your L<sup>A</sup>T<sub>E</sub>X system in respect of hyphenation patterns, write a file `hyphen.cfg`. If this file exists, it will be loaded instead of `hyphen.ltx`. See the comments below for additional information.

To produce the printed version of this file the following code is used. It can be extracted with the DOCSTRIP program, or one can run this file directly through L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>.

```
1 <*driver>
2 \documentclass{ltxdoc}
3 \begin{document}
4 \DocInput{lthyphen.dtx}
5 \end{document}
6 </driver>
```

The default file `hyphen.ltx` loads hyphenation patterns for US english. If you want to load additional or other hyphenation patterns, you should create a file `hyphen.cfg`. This is best done by starting from `hyphen.ltx`.

For backward compatibility, the default file, `hyphen.ltx`, first tries to load the file `hyphen.tex`. If this file exists, an information message is issued and the appropriate defaults for T<sub>E</sub>X's internal parameters are set: `\language` is initialized to 0, and `\lefthyphenmin` and `\righthyphenmin` to 2 and 3, respectively, to disallow x- or -xx breaks.

```
7 <*default>
8 \InputIfFileExists{hyphen.tex}%
9   {\message{Loading hyphenation patterns for US english.}}%
10   \language=0
11   \lefthyphenmin=2 \righthyphenmin=3 }%
```

Otherwise, since we cannot do anything without any hyphenation patterns, an error message is printed and the IniT<sub>E</sub>X run is terminated by invoking `\@@end` (which is the L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> name for T<sub>E</sub>X's `\end` primitive).

```
12   {\errhelp{The configuration for hyphenation is incorrectly
13             installed.^^J%
14             If you don't understand this error message you need
15             to seek^^Jexpert advice.}%
16   \errmessage{OOPS! I can't find any hyphenation patterns for
17             US english.^^J \space Think of getting some or the
18             latex2e setup will never succeed}\@@end}
19 </default>
```

The following example describes the possible contents of a file `hyphen.cfg` that will load both US English and German hyphenation patterns, making the former the default. It sets `\language` to 0 for the US patterns and to 1 for the German patterns. Then `\language` is set to 0 to make this the default and the default values of `\lefthyphenmin` and `\righthyphenmin` are set.

```
language=0
input hyphen % (or \input ushyphen1 if the file has been renamed)
language=1
input ghyph31
```

```
language=0
lefthyphenmin=2
righthyphenmin=3
endinput
```

Another possibility is to use the package `babel`, by Johannes Braams. That package is distributed with a suitable `hyphen.cfg` file.

# File aa

## ltfinal.dtx

### 1 Final settings

This section contains the final settings for L<sup>A</sup>T<sub>E</sub>X. It initializes some debugging and typesetting parameters, sets the default `\catcodes` and `uc/lc` codes, and inputs the hyphenation file.

#### 1.1 Debugging

By default, L<sup>A</sup>T<sub>E</sub>X shows statistics:

```
1 <*2ekernel>
2 \tracingstats1
```

#### 1.2 Typesetting parameters

```
\@lowpenalty These are penalties used internally.
\@medpenalty 3 \newcount\@lowpenalty
\@highpenalty 4 \newcount\@medpenalty
5 \newcount\@highpenalty
```

*(End definition for \@lowpenalty, \@medpenalty, and \@highpenalty.)*

```
\newmarks Allocate extended marks types if etex is active. Placed here at the end of the format to
increase compatibility with count allocations in earlier releases.
```

```
6 </2ekernel>
7 <*2ekernel | latexrelease>
8 <latexrelease>\IncludeInRelease{2015/01/01}%
9 <latexrelease>          {\newmarks}{Extended Allocation}%
10 \ifx\marks\@undefined\else
11 \def\newmarks{%
12   \e@alloc\marks \e@alloc@chardef{\count256}\m@ne\e@alloc@top}
13 \fi
14 </2ekernel | latexrelease>
15 <latexrelease>\EndIncludeInRelease
16 <latexrelease>\IncludeInRelease{0000/00/00}%
17 <latexrelease>          {\newmarks}{Extended Allocation}%
18 <latexrelease>\let\newmarks\@undefined
19 <latexrelease>\EndIncludeInRelease
20 <*2ekernel>
```

*(End definition for \newmarks.)*

Allocate 3 mark classes to be used in `\markboth` and `\markright`. Should be done earlier but for that definition of `\newmarks` needs moving (which it should I guess).

```
21 </2ekernel>
22 <*2ekernel | latexrelease>
23 <latexrelease>\IncludeInRelease{2022/06/01}%
24 <latexrelease>          {2e-left}{Delayed legacy marks}%
25 \NewMarkClass {2e-left}
```

```

26 \NewMarkClass {2e-right}
27 \NewMarkClass {2e-right-nonempty}

```

No rollback really, the marks will remain.

```

28 </2ekernel | latexrelease>
29 <latexrelease>\EndIncludeInRelease
30 <latexrelease>\IncludeInRelease{0000/00/00}%
31 <latexrelease> {2e-left}{Delayed legacy marks}%
32 <latexrelease>
33 <latexrelease>\EndIncludeInRelease
34 <*2ekernel>

```

```

\newXeTeXintercharclass Allocate \XeTeXintercharclass types if xetex is active. previously defined in xetex.ini.
\xe@alloc@intercharclass
\e@alloc@intercharclass@top

```

```

35 </2ekernel>
36 <*2ekernel | latexrelease>
37 <latexrelease>\IncludeInRelease{2015/01/01}%
38 <latexrelease> {\newXeTeXintercharclass}{Extended Allocation}%

```

Classes allocated 1 to 4094 (or 254 on older xetex) (In earlier XeLaTeX versions 1, 2 and 3 were pre-set for CJK).

```

39 \ifx\XeTeXcharclass\@undefined
40 \else
41 \ifdim\the\XeTeXversion\XeTeXrevision\p@>0.99993\p@
42 \chardef\e@alloc@intercharclass@top=4095
43 \else
44 \chardef\e@alloc@intercharclass@top=255
45 \fi
46 \def\newXeTeXintercharclass{%
47 \e@alloc\XeTeXcharclass
48 \chardef\xe@alloc@intercharclass\m@ne\xe@alloc@intercharclass@top}
49 \fi
50 </2ekernel | latexrelease>
51 <latexrelease>\EndIncludeInRelease
52 <latexrelease>\IncludeInRelease{0000/00/00}%
53 <latexrelease> {\newXeTeXintercharclass}{Extended Allocation}%
54 <latexrelease> \ifx\XeTeXcharclass\@undefined
55 <latexrelease> \else
56 <latexrelease> \def\xe@alloc@#1#2#3#4#5{\global\advance#1\@ne
57 <latexrelease> \xe@ch@ck#1#4#2%
58 <latexrelease> \allocationnumber#1%
59 <latexrelease> \global#3#5\allocationnumber
60 <latexrelease> \wlog{\string#5=\string#2\the\allocationnumber}}
61 <latexrelease> \def\xe@ch@ck#1#2#3{%
62 <latexrelease> \ifnum#1<#2\else
63 <latexrelease> \errmessage{No room for a new #3}%
64 <latexrelease> \fi}
65 <latexrelease> \def\newXeTeXintercharclass{%
66 <latexrelease> \xe@alloc\xe@alloc@intercharclass
67 <latexrelease> \XeTeXcharclass\chardef\@cclv}
68 <latexrelease> \fi
69 <latexrelease>\EndIncludeInRelease
70 <*2ekernel | latexrelease>
71 <latexrelease>\IncludeInRelease{2016/02/01}%

```

```

72 <latexrelease> {\xe@alloc@intercharclass}{Start of XeTeX class allocator}%
73 \ifx\XeTeXcharclass\@undefined
74 \else
75   \countdef\xe@alloc@intercharclass=257
76   \xe@alloc@intercharclass=\z@
77 \fi
78 </2ekernel | latexrelease>
79 <latexrelease>\EndIncludeInRelease
80 <latexrelease>\IncludeInRelease{2015/01/01}%
81 <latexrelease> {\xe@alloc@intercharclass}{Start of XeTeX class allocator}%
82 <latexrelease> \ifx\XeTeXcharclass\@undefined
83 <latexrelease> \else
84 <latexrelease>   \xe@alloc@intercharclass=\thr@@
85 <latexrelease> \fi
86 <latexrelease>\EndIncludeInRelease
87 <latexrelease>\IncludeInRelease{0000/00/00}%
88 <latexrelease> {\xe@alloc@intercharclass}{Start of XeTeX class allocator}%
89 <latexrelease> \ifx\XeTeXcharclass\@undefined
90 <latexrelease> \else
91 <latexrelease>   \newcount\xe@alloc@intercharclass
92 <latexrelease>   \xe@alloc@intercharclass=\thr@@
93 <latexrelease> \fi
94 <latexrelease>\EndIncludeInRelease
95 <*2ekernel>

```

(End definition for \newXeTeXintercharclass, \xe@alloc@intercharclass, and  
 \e@alloc@intercharclass@top.)

trace\string\_stack\string\_levels Now define the Lua function to emulate \tracingstacklevels and install it in the  
 input\_level\_string callback.

```

96 </2ekernel>
97 <*2ekernel | latexrelease>

```

In latexrelease mode we always remove the function from the callback, then add the  
 correct version later.

```

98 <latexrelease>\ifx\directlua\@undefined
99 <latexrelease>\else
100 <latexrelease> \directlua{%
101 <latexrelease>   if luatexbase.callbacktypes['input_level_string'] and %
102 <latexrelease>     luatexbase.in_callback('input_level_string','tracingstacklevels') then
103 <latexrelease>     luatexbase.remove_from_callback('input_level_string','tracingstacklevels')
104 <latexrelease>   end}%
105 <latexrelease>\fi
106 <latexrelease>\IncludeInRelease{2021/06/01}{trace_stack_levels}%
107 <latexrelease>   {Lua trace_stack_levels function}%
108 \ifx\directlua\@undefined
109 \else
110 <*2ekernel>
111   \expanded{%
112     \everyjob{\the\everyjob
113       \noexpand%\directlua
114 </2ekernel>
115     \directlua{%
116       local function trace_stack_levels (input_ptr)
117         local tracingstacklevels = tex.count.tracingstacklevels

```

```

118         if tex.tracingmacros > 0 or input_ptr < tracingstacklevels then
119             if tracingstacklevels > 0 then
120                 if input_ptr < tracingstacklevels then
121                     return "\string\n\string~" .. string.rep(".",input_ptr)
122                 else
123                     return "\string~\string~"
124                 end
125             else
126                 return "\string\n"
127             end
128         else
129             return ""
130         end
131     end
132     <latexrelease> if luatexbase.callbacktypes['input_level_string'] then
133         luatexbase.add_to_callback('input_level_string',
134             trace_stack_levels,'tracingstacklevels')
135     <latexrelease> end
136     }%
137     <*2ekernel>
138     }}%
139     </2ekernel>
140     \fi
141     <latexrelease>\EndIncludeInRelease
142     <latexrelease>

```

Then for the full rollback, just do nothing, since the function was already taken out of the rollback above.

```

143     <latexrelease>\IncludeInRelease{0000/00/00}{trace_stack_levels}%
144     <latexrelease> {Lua trace_stack_levels function}%
145     <latexrelease>% Nothing here
146     <latexrelease>\EndIncludeInRelease
147     </2ekernel | latexrelease>
148     <*2ekernel>

```

*(End definition for trace\string\_stack\string\_levels.)*

The default values of the picture and \fbox parameters:

```

149     \unitlength = 1pt
150     \fboxsep = 3pt
151     \fboxrule = .4pt

```

The saved value of T<sub>E</sub>X's \maxdepth:

```

152     \@maxdepth = \maxdepth

```

\vsize initialized because a \clearpage with \vsize < \topskip causes trouble. \@colroom and \@colht also initialized because \vsize may be set to them if a \clearpage is done before the \begin{document}

```

153     \vsize = 1000pt
154     \@colroom = \vsize
155     \@colht = \vsize

```

Initialise \textheight \textwidth and page style, to avoid internal errors if they are not set by the class.

```

156     \textheight=.5\maxdimen
157     \textwidth=\textheight
158     \ps@empty

```

### 1.3 Lccodes for hyphenation

For 7- and 8-bit engines the assumption of T1 encodings is the basis for the hyphenation patterns. That's not the case for the Unicode engines, where the assumption is engine-native working. The common loader system provides access to data from the Unicode Consortium covering not only `\lccode` but also other related data. The `\lccode` part of that at least needs to be loaded before hyphenation is tackled: XeTeX follows the standard TeX route of building patterns into the format. LuaTeX doesn't require this data be loaded *here* but it does need to be loaded somewhere. Rather than test for the Unicode engines by name, the approach here is to look for the extended math mode handling both provide: any other engine developed in this area will presumably also provide `\Umathcode`.

```
159 \ifnum 0%
160   \ifx\Umathcode\@undefined\else 1\fi
161   \ifx\XeTeXmathcode\@undefined\else 1\fi
162   >\z@
163   \message{ Unicode character data,}
164   \input{load-unicode-data}
165 \endkernel)
166 \latexrelease\IncludeInRelease{2016/02/01}%
167 \latexrelease {\XeTeXintercharclasses}{XeTeX character classes}%
168 \latexrelease \ifx\XeTeXinterchartoks\undefined
169 \latexrelease \else
170 \latexrelease \begingroup
171 \latexrelease \chardef\XeTeXcharclassID = 0 %
172 \latexrelease \chardef\XeTeXcharclassOP = 0 %
173 \latexrelease \chardef\XeTeXcharclassCL = 0 %
174 \latexrelease \chardef\XeTeXcharclassEX = 0 %
175 \latexrelease \chardef\XeTeXcharclassIS = 0 %
176 \latexrelease \chardef\XeTeXcharclassNS = 0 %
177 \latexrelease \chardef\XeTeXcharclassCM = 0 %
178 \latexrelease \input{load-unicode-xetex-classes}
179 \latexrelease \endgroup
180 \latexrelease \global\let\xtxHanGlue\undefined
181 \latexrelease \global\let\xtxHanSpace\undefined
182 \latexrelease \global\XeTeXinterchartoks 0 1 = {}
183 \latexrelease \global\XeTeXinterchartoks 0 2 = {}
184 \latexrelease \global\XeTeXinterchartoks 0 3 = {}
185 \latexrelease \global\XeTeXinterchartoks 1 0 = {}
186 \latexrelease \global\XeTeXinterchartoks 2 0 = {}
187 \latexrelease \global\XeTeXinterchartoks 3 0 = {}
188 \latexrelease \global\XeTeXinterchartoks 1 1 = {}
189 \latexrelease \global\XeTeXinterchartoks 1 2 = {}
190 \latexrelease \global\XeTeXinterchartoks 1 3 = {}
191 \latexrelease \global\XeTeXinterchartoks 2 1 = {}
192 \latexrelease \global\XeTeXinterchartoks 2 2 = {}
193 \latexrelease \global\XeTeXinterchartoks 2 3 = {}
194 \latexrelease \global\XeTeXinterchartoks 3 1 = {}
195 \latexrelease \global\XeTeXinterchartoks 3 2 = {}
196 \latexrelease \global\XeTeXinterchartoks 3 3 = {}
197 \latexrelease \fi
198 \latexrelease\EndIncludeInRelease
199 \latexrelease\IncludeInRelease{0000/00/00}%
```

```

200 <latexrelease> {\XeTeXintercharclasses}{XeTeX character classes}%
201 <latexrelease> \ifx\XeTeXinterchartoks\undefined
202 <latexrelease> \else
203 <latexrelease> \input{load-unicode-xetex-classes}
204 <latexrelease> \gdef\xtxHanGlue{\hskip0pt plus 0.1em\relax}
205 <latexrelease> \gdef\xtxHanSpace{\hskip0.2em plus 0.2em minus 0.1em\relax}
206 <latexrelease> \global\XeTeXinterchartoks 0 1 = {\xtxHanSpace}
207 <latexrelease> \global\XeTeXinterchartoks 0 2 = {\xtxHanSpace}
208 <latexrelease> \global\XeTeXinterchartoks 0 3 = {\nobreak\xtxHanSpace}
209 <latexrelease> \global\XeTeXinterchartoks 1 0 = {\xtxHanSpace}
210 <latexrelease> \global\XeTeXinterchartoks 2 0 = {\nobreak\xtxHanSpace}
211 <latexrelease> \global\XeTeXinterchartoks 3 0 = {\xtxHanSpace}
212 <latexrelease> \global\XeTeXinterchartoks 1 1 = {\xtxHanGlue}
213 <latexrelease> \global\XeTeXinterchartoks 1 2 = {\xtxHanGlue}
214 <latexrelease> \global\XeTeXinterchartoks 1 3 = {\nobreak\xtxHanGlue}
215 <latexrelease> \global\XeTeXinterchartoks 2 1 = {\nobreak\xtxHanGlue}
216 <latexrelease> \global\XeTeXinterchartoks 2 2 = {\nobreak\xtxHanGlue}
217 <latexrelease> \global\XeTeXinterchartoks 2 3 = {\xtxHanGlue}
218 <latexrelease> \global\XeTeXinterchartoks 3 1 = {\xtxHanGlue}
219 <latexrelease> \global\XeTeXinterchartoks 3 2 = {\xtxHanGlue}
220 <latexrelease> \global\XeTeXinterchartoks 3 3 = {\nobreak\xtxHanGlue}
221 <latexrelease> \fi
222 <latexrelease> \EndIncludeInRelease
223 <*2ekernel>

```

There is one over-ride that makes sense here (see below for the same for 8-bit engines): setting the lccode for - to itself.

```
224 \lccode'\- ='\- % default hyphen char
```

The alternative is that a “traditional” engine is in use.

```
225 \else
```

We set things up so that hyphenation files can assume that the default (T1) lccodes are in use (at present this also sets up the uccodes). We temporarily define `\reserved@a` to apply `\reserved@c` to all the numbers in the range of its arguments.

```

226 \def\reserved@a#1#2{%
227   \@tempcnta#1\relax
228   \@tempcntb#2\relax
229   \reserved@b
230 }
231 \def\reserved@b{%
232   \ifnum\@tempcnta>\@tempcntb\else
233     \reserved@c\@tempcnta
234     \advance\@tempcnta\@ne
235     \expandafter\reserved@b
236   \fi
237 }

```

Depending on the T<sub>E</sub>X version, we might not be allowed to do this for non-ASCII characters.

```

238 \def\reserved@c#1{%
239   \count@=#1\advance\count@ by -"20
240   \uccode#1=\count@
241   \lccode#1=#1
242 }

```



```

243 \reserved@a{'\a}{'\z}
244 \reserved@a{"A0}{\BC}
245 \reserved@a{"E0}{\FF}

```

The upper case characters need their `\uccode` and `\lccode` values set, and their `\sfcode` set to 999.

```

246 \def\reserved@c#1{%
247   \count@=#1\advance\count@ by "20
248   \uccode#1=#1
249   \lccode#1=\count@
250   \sfcode#1=999
251 }
252 \reserved@a{'\A}{'\Z}
253 \reserved@a{"80}{\9C}
254 \reserved@a{"C0}{\DF}

```

Well, it would be nice if that were correct, but unfortunately, the Cork encoding contains some odd slots whose `uccode` or `lccode` isn't quite what you'd expect.

```

255 \uccode'\^^Y='I      % dotless i
256 \lccode'\^^Y='^^Y    % dotless i
257 \uccode'\^^Z='J      % dotless j, ae in OT1
258 \lccode'\^^Z='^^Z    % dotless j, ae in OT1
259 \lccode'\^^9d='i     % dotted I
260 \uccode'\^^9d='^^9d  % dotted I
261 \lccode'\^^9e='^^9e  % d-bar
262 \uccode'\^^9e='^^d0  % d-bar

```

Finally here is one that helps hyphenation in the OT1 encoding.

```

263 \lccode'\^^[='^^[    % oe in OT1

```

And we also set the `\lccode` of `\-` and `\textcompwordmark` so that they do not prevent hyphenation in the remainder of the word (as suggested by Lars Helström).

```

264 \lccode'\- ='\'      % default hyphen char
265 \lccode 127=127      % alternate hyphen char
266 \lccode 23 =23       % textcompwordmark in T1

```

End of the conditional to select either Unicode or T1 encoding defaults.

```

267 \fi

```

At this stage, we can install any last-minute `expl3` set-up.

```

268 \@expl@finalise@setup@@
269 \def\@expl@finalise@setup@@{}

```

This is as good a place as any to active a few XeTeX-specific settings

```

270 \ifx\XeTeXuseglyphmetrics\@undefined
271 \else
272   \XeTeXuseglyphmetrics=1 %
273   \XeTeXdashbreakstate=1 %
274 \fi

```

## 1.4 Hyphenation

The following code will be compiled into the format file. It checks for the existence of `hyphen.cfg` in inputs that file if found. Otherwise it inputs `hyphen.ltx`. Note that these are loaded in *before* the `\catcodes` are set, so local hyphenation files can use 8-bit input.

We try to load the customized hyphenation description file.

```

275 \InputIfFileExists{hyphen.cfg}
276     {\typeout{=====^J%
277             Local configuration file hyphen.cfg used^J%
278             =====}%
279     \def\@addtofilelist##1{\xdef\@filelist{\@filelist,##1}}%
280     }
281     {\input{hyphen.ltx}}
282 \let\@addtofilelist\@gobble

```

`\l@nohyphenation`

```

283 \ifx\l@nohyphenation \@undefined
284 \newlanguage\l@nohyphenation
285 \fi

```

*(End definition for \l@nohyphenation.)*

`\document@default@language` Default document language. -1 acts as language 0, but used as a flag in `\document` to see if it has been set in the preamble.

```

286 \</2ekernel>
287 \<*2ekernel | latexrelease>
288 \<latexrelease>\IncludeInRelease{2017/04/15}%
289 \<latexrelease>    {\document@default@language}{Save language for hyphenation}%
290 \let\document@default@language\m@ne
291 \</2ekernel | latexrelease>
292 \<latexrelease>\EndIncludeInRelease
293 \<latexrelease>\IncludeInRelease{0000/00/00}%
294 \<latexrelease>    {\document@default@language}{Save language for hyphenation}%
295 %
296 \<latexrelease>\let\document@default@language\@undefined
297 \<latexrelease>\EndIncludeInRelease
298 \<*2ekernel>

```

*(End definition for \document@default@language.)*

## 1.5 Font loading

Fonts loaded during the formatting process might already have changed the `\font@submax` from `0pt` to something higher. If so, we put out a bold warning.

```

299 \ifdim \font@submax >\z@
300     \@font@warning{Size substitutions with differences\MessageBreak
301                   up to \font@submax\space have occurred.\MessageBreak
302                   \MessageBreak
303                   Please check the transcript file
304                   carefully\MessageBreak
305                   and redo the format generation if necessary!
306                   \@gobbletwo}%
307     \errhelp{Only stopped, to give you time to
308             read the above message.}
309     \errmessage{}

```

We reset the macro. Otherwise every user will get a warning on every job.

```

310 \def\font@submax{0pt}
311 \fi

```

For pdfT<sub>E</sub>X preload and enable automatic glyph to Unicode mapping for more reliable copy and paste support.

```

312 </2ekernel>
313 <*2ekernel | latexrelease>
314 <latexrelease>\IncludeInRelease{2021/06/01}%
315 <latexrelease>          {\pdfgentounicode}{Preload glyphtounicode}%
316 \ifx \pdfgentounicode \@undefined \else
317 <*2ekernel>
318   \ifnum 0=0%
319     \ifdefined\pdftexversion
320 % \pdftexversion<140 does not have \pdfgentounicode, so we only check higher values
321     \ifnum \pdftexversion=140 \ifnum\pdftexrevision<22 1\fi\fi
322     \fi
323     \relax
324 </2ekernel>
325     \input glyphtounicode
326 <*2ekernel>
327   \else
328     \begingroup
329       \everyeof{\noexpand}\endlinechar-1
330       \edef\x{\endgroup
331         \everyjob{\the\everyjob\@@input glyphtounicode }%
332       }\x
333     \fi
334 </2ekernel>
335     \pdfgentounicode=1
336   \fi
337 </2ekernel | latexrelease>
338 <latexrelease>\EndIncludeInRelease

```

When rolling back we can't unload the glyphtounicode mappings, but we can reset `\pdfgentounicode` to ensure that they aren't used.

```

339 <latexrelease>\IncludeInRelease{0000/00/00}%
340 <latexrelease>          {\pdfgentounicode}{Preload glyphtounicode}%
341 <latexrelease>\ifx \pdfgentounicode \@undefined \else
342 <latexrelease> \pdfgentounicode=0
343 <latexrelease>\fi
344 <latexrelease>\EndIncludeInRelease
345 <*2ekernel>

```

## 1.6 Input encoding

Starting with the 2018 L<sup>A</sup>T<sub>E</sub>X release default the inputencoding to UTF-8. Unless the format is being used with luatex, xetex, enc<sub>te</sub>x or ml<sub>te</sub>x.

This is done in a way largely compatible with older releases: `utf8.def` is input just as if

```
\usepackage[utf8]{inputenc}
```

had been used, however rather than input the whole package a minimal core part just enough to support loading the UTF-8 encoding files is defined here.

If a document re-specifies UTF-8 this is silently ignored.

```

346 </2ekernel>
347 <*2ekernel | latexrelease>

```

Check that a classic 8-bit tex engine is being used (LaTeX or PDFLaTeX).

```
348 \latexrelease\IncludeInRelease{2018/04/01}%
349 \latexrelease\UTFviii@invalid\UTF-8 default}%
```

Skip this section in Unicode TeX, or if MLTeX and EncTeX are enabled.

```
350 \ifnum0%
351   \ifx\Umathcode\@undefined\else 1\fi
352   \ifx\mubyte\@undefined\else 1\fi
353   \ifx\charsubdef\@undefined\else 1\fi
354   =\z@

355 \def\saved@space@catcode{10}
356 \let\@inpenc@test\relax
357 \def\IeC{%
358   \ifx\protect\@typeset@protect
359     \expandafter\@firstofone
360   \else
361     \noexpand\IeC
362   \fi
363 }
```

Make characters active for UTF-8 input formats

```
364 \@tempcnta=1
365 \loop
366   \catcode\@tempcnta=13 %
367   \advance\@tempcnta\@ne %
368   \ifnum\@tempcnta<32 %
369   \repeat %
370 \catcode0=15 % null
371 \catcode9=10 % tab
372 \catcode10=12 % ctrl J
373 \catcode12=13 % ctrl L
374 \catcode13=5 % newline
375 \@tempcnta=128
376 \loop
377   \catcode\@tempcnta=13
378   \advance\@tempcnta\@ne
379   \ifnum\@tempcnta<256
380   \repeat
```

**\UseRawInputEncoding** Reset 8 bit characters to catcode 12 so the input encoding matches the “Raw” font encoding. Useful for special behaviours, or for compatibility with older L<sup>A</sup>T<sub>E</sub>X formats.

```
381 \def\UseRawInputEncoding{%
382   \let\inputencodingname\@undefined % revert
383   \let\DeclareFontEncoding\DeclareFontEncoding@saved % revert
384   \let\DeclareUnicodeCharacter\@undefined % revert
385   \@tempcnta=1
386   \loop
387     \catcode\@tempcnta=15 %
388     \advance\@tempcnta\@ne %
389     \ifnum\@tempcnta<32 %
390     \repeat %
391   \catcode0=15 % null
392   \catcode9=10 % tab
```

```

393 \catcode10=12 % ctrl J
394 \catcode12=13 % ctrl L
395 \catcode13=5 % newline
396 \@tempcnta=128
397 \loop
398   \catcode\@tempcnta=12
399   \advance\@tempcnta\@ne
400 \ifnum\@tempcnta<256
401 \repeat
402 }

```

(End definition for \UseRawInputEncoding.)

\DeclareFontEncoding@saved Saved version of \DeclareFontEncoding@ before utf8.def modifies it for use in \UseRawInputEncoding above.

```

403 \let\DeclareFontEncoding@saved\DeclareFontEncoding@

```

(End definition for \DeclareFontEncoding@saved.)

```

404 \edef\inputencodingname{utf8}%
405 \input{utf8.def}
406 \let\UTFviii@undefined@err@@\UTFviii@undefined@err
407 \let\UTFviii@invalid@err@@\UTFviii@invalid@err
408 \let\UTFviii@two@octets@@\UTFviii@two@octets
409 \let\UTFviii@three@octets@@\UTFviii@three@octets
410 \let\UTFviii@four@octets@@\UTFviii@four@octets
411 <2kernel>\def\UTFviii@undefined@err#1{\@gobble#1}%
412 <2kernel>\let\UTFviii@invalid@err\string
413 <2kernel>\let\UTFviii@two@octets\string
414 <2kernel>\let\UTFviii@three@octets\string
415 <2kernel>\let\UTFviii@four@octets\string
416 <2kernel>\everyjob\expandafter{\the\everyjob
417 <2kernel>\let\UTFviii@undefined@err\UTFviii@undefined@err@@
418 <2kernel>\let\UTFviii@invalid@err\UTFviii@invalid@err@@
419 <2kernel>\let\UTFviii@two@octets\UTFviii@two@octets@@
420 <2kernel>\let\UTFviii@three@octets\UTFviii@three@octets@@
421 <2kernel>\let\UTFviii@four@octets\UTFviii@four@octets@@
422 <2kernel>}}
423 \let\@inpenc@test\@undefined
424 \let\saved@space@catcode\@undefined

```

For formats not set up for UTF-8 default, set the C0 controls to catcode 15.

```

425 \else
426 \@tempcnta=0
427 \loop
428   \catcode\@tempcnta=15 %
429   \advance\@tempcnta\@ne %
430 \ifnum\@tempcnta<32 %
431 \repeat %
432 \catcode0=15 % null
433 \catcode9=10 % tab
434 \catcode10=12 % ctrl J
435 \catcode12=13 % ctrl L
436 \catcode13=5 % newline
437 \let\UseRawInputEncoding\relax

```

This ends the skipped code in Unicode engines:

```

438 \fi
439 \if2ekernel|latexrelease
440 \latexrelease\EndIncludeInRelease
441 \latexrelease\IncludeInRelease{0000/00/00}%
442 \latexrelease{\UTFviii@invalid}{UTF-8 default}%

The first block of commands got only introduced in 2019 but we revert all of Unicode
support in one go not jump to the intermediate version.

443 \latexrelease\let\UTFviii@two@octets@combine\@undefined
444 \latexrelease\let\UTFviii@three@octets@combine\@undefined
445 \latexrelease\let\UTFviii@four@octets@combine\@undefined
446 \latexrelease\let\UTFviii@two@octets@string\@undefined
447 \latexrelease\let\UTFviii@three@octets@string\@undefined
448 \latexrelease\let\UTFviii@four@octets@string\@undefined
449 \latexrelease\let\UTFviii@two@octets@noexpand\@undefined
450 \latexrelease\let\UTFviii@three@octets@noexpand\@undefined
451 \latexrelease\let\UTFviii@four@octets@noexpand\@undefined

452 \latexrelease\@tempcnta=0
453 \latexrelease\loop
454 \latexrelease\catcode\@tempcnta=15
455 \latexrelease\advance\@tempcnta\@ne
456 \latexrelease\ifnum\@tempcnta<32
457 \latexrelease\repeat %
458 \latexrelease\catcode9=10 % tab
459 \latexrelease\catcode10=12 % ctrl J
460 \latexrelease\catcode12=13 % ctrl L
461 \latexrelease\catcode13=5 % newline
462 \latexrelease\@tempcnta=128
463 \latexrelease\loop
464 \latexrelease\catcode\@tempcnta=12
465 \latexrelease\advance\@tempcnta\@ne
466 \latexrelease\ifnum\@tempcnta<256
467 \latexrelease\repeat
468 \latexrelease\let\IeC\@undefined
469 \latexrelease\def\DeclareFontEncoding@#1#2#3{%
470 \latexrelease\expandafter
471 \latexrelease\ifx\csname T@#1\endcsname\relax
472 \latexrelease\def\cdp@elt{\noexpand\cdp@elt}%
473 \latexrelease\xdef\cdp@list{\cdp@list\cdp@elt{#1}%
474 \latexrelease{\default@family}{\default@series}%
475 \latexrelease{\default@shape}}%
476 \latexrelease\expandafter\let\csname#1-cmd\endcsname\@changed@cmd
477 \latexrelease\else
478 \latexrelease\@font@info{Redeclaring font encoding #1}%
479 \latexrelease\fi
480 \latexrelease\global\@namedef{T@#1}{#2}%
481 \latexrelease\global\@namedef{M@#1}{\default@M#3}%
482 \latexrelease\xdef\LastDeclaredEncoding{#1}%
483 \latexrelease}
484 \latexrelease\let\UseRawInputEncoding\@undefined
485 \latexrelease\let\DeclareFontEncoding@saved\@undefined
486 \latexrelease\let\inputencodingname\@undefined
487 \latexrelease\EndIncludeInRelease

```

```

488 <*2ekernel>
489 % \begin{macrocode}
490 %
491 % We temporarily define |\reserved@a| to apply |\reserved@c| to all the
492 % numbers in the range of its arguments.
493 % \begin{macrocode}
494 \def\reserved@a#1#2{%
495     \@tempcnta#1\relax
496     \@tempcntb#2\relax
497     \reserved@b
498 }
499 \def\reserved@b{%
500     \ifnum\@tempcnta>\@tempcntb\else
501         \reserved@c\@tempcnta
502         \advance\@tempcnta\@ne
503         \expandafter\reserved@b
504     \fi
505 }

```

Set the special catcodes (although some of these are useless, since an error will have occurred if the catcodes have changed). Note that `^^J` has catcode ‘other’ for use in warning messages.

```

506 \catcode'\ =10
507 \catcode'\# =6
508 \catcode'\$ =3
509 \catcode'\% =14
510 \catcode'\& =4
511 \catcode'\' =0
512 \catcode'\^ =7
513 \catcode'\_ =8
514 \catcode'\{ =1
515 \catcode'\} =2
516 \catcode'\~ =13
517 \catcode'\@ =11
518 \catcode'\^^I =10
519 \catcode'\^^J =12
520 \catcode'\^^L =13
521 \catcode'\^^M =5

```

Set the ‘other’ catcodes.

```

522 \def\reserved@c#1{\catcode#1=12\relax}
523 \reserved@c{'\!}
524 \reserved@c{'\"}
525 \reserved@a{'\' }{'\?}
526 \reserved@c{'\[]
527 \reserved@c{'\]}
528 \reserved@c{'\' }
529 \reserved@c{'\|}

```

Set the ‘letter’ catcodes.

```

530 \def\reserved@c#1{\catcode#1=11\relax}
531 \reserved@a{'\A }{'\Z}
532 \reserved@a{'\a }{'\z}

```

All the characters in the range 0–31 and 127–255 are illegal, *except* `tab` (`^^I`), `nl` (`^^J`), `ff` (`^^L`) and `cr` (`^^M`).

## 1.7 Lccodes and uccodes

We now again set up the default (T1) uc/lccodes. The lower case characters need their `\uccode` and `\lccode` values set. Some of this is a repeat of the set-up before loading hyphenation files. Depending on the T<sub>E</sub>X version, we might not be allowed to do this for non-ASCII characters. For the Unicode engines (XeT<sub>E</sub>X and LuaT<sub>E</sub>X) there is no need to do any of this: they use hyphenation data which does not alter any of the set up and so this entire block is skipped.

```

533 \ifnum 0%
534   \ifx\Umathcode\@undefined\else 1\fi
535   \ifx\XeTeXmathcode\@undefined\else 1\fi
536   >\z@
537 \else
538 \def\reserved@c#1{%
539   \count@=#1\advance\count@ by -"20
540   \uccode#1=\count@
541   \lccode#1=#1
542 }
543 \reserved@a{'\a}{'\z}
544 \reserved@a{"A0}{\BC}
545 \reserved@a{"E0}{\FF}

```

The upper case characters need their `\uccode` and `\lccode` values set, and their `\sfcode` set to 999.

```

546 \def\reserved@c#1{%
547   \count@=#1\advance\count@ by "20
548   \uccode#1=#1
549   \lccode#1=\count@
550   \sfcode#1=999
551 }
552 \reserved@a{'\A}{'\Z}
553 \reserved@a{"80}{\9C}
554 \reserved@a{"C0}{\DF}

```

Well, it would be nice if that were correct, but unfortunately, the Cork encoding contains some odd slots whose uccode or lccode isn't quite what you'd expect.

```

555 \uccode'\^^Y='I % dotless i
556 \lccode'\^^Y='^^Y % dotless i
557 \uccode'\^^Z='J % dotless j, ae in OT1
558 \lccode'\^^Z='^^Z % dotless j, ae in OT1
559 \lccode'\^^9d='i % dotted I
560 \uccode'\^^9d='^^9d % dotted I
561 \lccode'\^^9e='^^9e % d-bar
562 \uccode'\^^9e='^^d0 % d-bar

```

Finally here is one that helps hyphenation in the OT1 encoding.

```

563 \lccode'\^^[='^^[ % oe in OT1
564 \fi % End of reset block for 8-bit engines

```

```

\MakeUppercase
\MakeUppercase
\NoCaseChange
\@uclclist
\@expl@text@lowercase@n
\@expl@text@uppercase@n
\@uclclist

```

And whilst we're doing things with uc/lc tables, here are two commands to upper- and lower-case a string.

*Note* that this implementation is subject to change! At the moment we're not providing any way to extend the list of uc/lc commands, since finding a good interface is difficult. These commands have some nasty features, such as uppercasing mathematics,



environment names, labels, etc. A much better long-term solution is to use all-caps fonts, but these aren't generally available.

Two wrappers around the L3 case changing functions. `\protected` to make them mostly safe as replacements for `\uppercase` and `\lowercase`.

```

565 \ExplSyntaxOn
566 \protected\def\@expl@text@lowercase@@n{\text_lowercase:n}
567 \protected\def\@expl@text@uppercase@@n{\text_uppercase:n}

    \NoCaseChange protects its argument from the case change functions.
568 \tl_put_right:Nn \l_text_case_exclude_arg_tl { \NoCaseChange }
569 \cs_new_protected:Npn \NoCaseChange #1 {#1}
570 \ExplSyntaxOff

571 \DeclareRobustCommand{\MakeUppercase}[1]{%
572     \def\i{I}\def\j{J}%
573     \def\reserved@a##1##2{\let##1##2\reserved@a}%
574     \expandafter\reserved@a\@uclclist\reserved@b{\reserved@b\@gobble}%

Tell UTF-8 processing to process chars even though we are in an \protected@edef.
575     \protected@edef\reserved@a{\@expl@text@uppercase@@n{\noexpand\unexpanded{#1}}}%
576     \reserved@a
577 }
578 \DeclareRobustCommand{\MakeLowercase}[1]{%
579     \def\reserved@a##1##2{\let##2##1\reserved@a}%
580     \expandafter\reserved@a\@uclclist\reserved@b{\reserved@b\@gobble}%
581     \protected@edef\reserved@a{\@expl@text@lowercase@@n{\noexpand\unexpanded{#1}}}%
582     \reserved@a
583 }

584 \def\@uclclist{\oe\OE\o\O\ae\AE
585     \dh\DH\dj\DJ\l\L\ng\NG\ss\SS\ij\IJ\th\TH}

```

The above code works, but has the nasty side-effect that if you say something like:

```

\markboth{\MakeUppercase\contentsname}
        {\MakeUppercase\contentsname}

```

then the uppercasing is only done to the first letter of the contents name, since the mark expands out to:

```

\mark{\protect\MakeUppercase Table of Contents}
        {\protect\MakeUppercase Table of Contents}

```

In order to get round this, we redefine `\MakeUppercase` and `\MakeLowercase` to grab their argument and brace it. This is a very low-level hack, and is *not* recommended practice! This is an instance of a general problem that makes it unsafe to grab arguments unbraced, and probably needs a more general solution. For the moment though, this hack will do:

```

586 \protected@edef\MakeUppercase#1{\MakeUppercase{#1}}
587 \protected@edef\MakeLowercase#1{\MakeLowercase{#1}}

```

(End definition for `\MakeUppercase` and others.)

## 1.8 Applying Patch files

Between major releases, small patches will be distributed in files `ltpatch.ltx` which must be added at this point.

Patch file code removed.

```
588 %\IfFileExists{ltpatch.ltx}
589 % {\typeout{=====^^J%
590 %      Applying patch file ltpatch.ltx^^J%
591 %      =====}}
592 % \def\fmtversion@topatch{unknown}
593 % \input{ltpatch.ltx}
594 % \ifx\fmtversion\fmtversion@topatch
595 % \ifx\patch@level\@undefined
596 % \typeout{^^J^^J^^J%
597 %      !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!^^J%
598 %      !! Patch file 'ltpatch.ltx' not suitable for this^^J%
599 %      !! version of LaTeX.^^J^^J%
600 %      !! Please check if initex found an old patch file:^^J%
601 %      !! --- if so, rename it or delete it, and redo the^^J%
602 %      !! initex run.^^J%
603 %      !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!^^J}%
604 % \batchmode \@@end
605 % \else
```

The code below adds the 'patch level' string to the first `\typeout` in the startup banner.

```
606 % \def\fmtversion@topatch{0}%
607 % \ifx\fmtversion@topatch\patch@level\else
608 % \def\reserved@a\typeout##1##2\reserved@a{%
609 % \typeout{##1 patch level \patch@level}##2}
610 % \everyjob\expandafter\expandafter\expandafter{%
611 % \expandafter\reserved@a\the\everyjob\reserved@a}
612 % \let\reserved@a\relax
613 % \the\everyjob
614 % \fi
615 % \fi
616 % \else
617 % \typeout{^^J^^J^^J%
618 %      !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!^^J%
619 %      !! Patch file 'ltpatch.ltx' (for version <\fmtversion@topatch>)^^J%
620 %      !! is not suitable for version <\fmtversion> of LaTeX.^^J^^J%
621 %      !! Please check if initex found an old patch file:^^J%
622 %      !! --- if so, rename it or delete it, and redo the^^J%
623 %      !! initex run.^^J%
624 %      !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!^^J}%
625 % \batchmode \@@end
626 % \fi
627 % \let\fmtversion@topatch\relax
628 % }
```

## 1.9 Freeing Memory

`\reserved@a` And just to make sure nobody relies on those definitions of `\reserved@b` and friends.  
`\reserved@b` These macros are reserved for use in the kernel. *Do not use them as general scratch macros.*

```

629 \let\reserved@a\@filelist
630 \let\reserved@b=\@undefined
631 \let\reserved@c=\@undefined
632 \let\reserved@d=\@undefined
633 \let\reserved@e=\@undefined
634 \let\reserved@f=\@undefined

(End definition for \reserved@a and \reserved@b.)

```

```

\toks

635 \toks0{}
636 \toks2{}
637 \toks4{}
638 \toks6{}
639 \toks8{}

(End definition for \toks.)

```

```

\errhelp Empty the error help message, which may have some rubbish:
640 \errhelp{}

(End definition for \errhelp.)

```

## 1.10 Initialise file list

**\@providesfile** Initialise for use in the document. During initex a modified version has been used which leaves debugging information for `latexbug.tex`.

```

641 \def\@providesfile#1[#2]{%
642   \wlog{File: #1 #2}%
643   \expandafter\xdef\csname ver@#1\endcsname{#2}%
644   \endgroup}

(End definition for \@providesfile.)

```

**\@filelist** Reset `\@filelist` so files input while making the format are not listed. The list built up so far may take up a lot of memory and so it is moved to `\reserved@a` where it will be overwritten as soon as almost any `LATEX` command is issued in a class file. However the `latexbug.tex` program will be able to access this information and insert it into a bug report.

```

645 \let\@filelist\@gobble
646 \def\@addtofilelist#1{\xdef\@filelist{\@filelist,#1}}%

(End definition for \@filelist and \@addtofilelist.)

```

## 1.11 Preparation for supporting PDF in backends

At the current point in time, basic support for PDF in backends is not part of `LATEX` core; it is provided by external packages. At some time in the future that work will be placed into the kernel but for now it is separate and has to be explicitly loaded in the document.

In that code there is a command `\IfPDFManagementActiveTF` which can be used by packages in order to execute different code depending on the whether this basic backend support is loaded.

To make this also work properly when this external package is not loaded at all, we here add this command already in the kernel (with a trivial definition); thus any package can query this loading state in all circumstances. Once this basic PDF backend support gets moved to the kernel, this definition will vanish again from here or, rather, it will be replaced by a real test.

`\IfPDFManagementActiveTF` So long as the code for the basic backend support for PDF is not loaded, the test that is implicit here will always return the false branch. Once this code is loaded, this definition will get replaced by a real test (as it is then possible that the management code is either activated or not activated).

```
647 \let \IfPDFManagementActiveTF \@secondoftwo
```

*(End definition for \IfPDFManagementActiveTF.)*

## 1.12 Do some temporary work for pre-release

This is a good place to load code that hasn't yet been integrated into the other files ...

## 1.13 Some last minute initializations ...

Load the first aid set of definitions for external packages that await updates.

```
648 \@input{latex2e-first-aid-for-external-files.ltx}
```

## 1.14 Dumping the format

Finally we make @ into a letter, ensure the format will be in the 'normal' error mode, and dump everything into the format file.

```
649 \makeatother
650 \errorstopmode
651 \dump
652 \</2kernel>
```

# Change History

1985-11-04 ltmath.dtx LaTeX2.09		<code>\mathversion</code> : Test if version defined added. . . . .	421
General: produce warning message if line extends into margin. Doesn't warn about formula overprinting equation number. . . . .	648		
1989-04-10 ltfssbas.dtx v1.0a		1989-04-29 ltfssbas.dtx v1.0i	
General: Starting with version numbers! <code>\ifmmode</code> added in <code>\math@group</code> . . . . .	410	General: Removed the <code>\halign</code> <code>\noalign</code> correction (wasn't bugfree) . . . . .	410
1989-04-10 ltfssbas.dtx v1.0b		1989-04-29 ltfssini.dtx v1.0f	
General: <code>\preload@sizes</code> added. . . . .	410	General: Corrections to L <sup>A</sup> T <sub>E</sub> X tabular env. added. . . . .	518
<code>\wrong@fontshape</code> changed to define substitution font/shape macro. . . . .	410	1989-05-01 ltfssbas.dtx v1.0j	
1989-04-10 ltfssini.dtx v1.0a		General: Default for <code>\baselinestretch</code> added. . . . .	410
General: Starting with version numbers <code>\newif</code> for <code>\@tempswa</code> added since this switch is unknown at the time when this file is read in. (latex.tex is loaded later.) <code>\math@famname</code> changed to <code>\math@version</code> . . . . .	518	1989-05-22 ltfssbas.dtx v1.0k	
1989-04-14 ltfssbas.dtx v1.0c		General: Lines longer than 72 characters folded. . . . .	410
General: More documentation added. . . . .	410	1989-05-22 ltfssini.dtx v1.0g	
1989-04-15 ltfssini.dtx v1.0b		General: Lines shortened to 72 characters . . . . .	518
General: <code>\mathfontset</code> renamed to <code>\mathversion</code> . . . . .	518	1989-09-14 ltfssbas.dtx v1.0m	
1989-04-19 ltfssbas.dtx v1.0d		General: Global replacement: <code>\group</code> to <code>\mathgroup</code> . . . . .	410
General: Even more doc. . . . .	410	<code>\mathversion</code> : Corrected typo: <code>\endscname</code> to <code>\endcsname</code> . . . . .	421
1989-04-21 ltfssbas.dtx v1.0e		1989-11-07 ltfssini.dtx v1.0i	
General: Documentation is fun! Parameters of <code>\define@mathalphabet</code> changed. . . . .	410	General: All family, series, and shape names abbreviated. . . . .	518
1989-04-21 ltfssini.dtx v1.0c		1989-11-08 ltfssbas.dtx v1.0o	
General: Changed to conform to fam.tex. . . . .	518	General: First parameter of <code>\define@mathalphabet</code> and <code>\define@mathgroup</code> changed from string to control sequence. . . . .	410
1989-04-23 ltfssbas.dtx v1.0f		1989-11-14 ltfssbas.dtx v1.0p	
General: % in <code>\getanddefinefonts</code> added. . . . .	410	<code>\math@version</code> : Math version prefix 'mv@' added. . . . .	421
1989-04-26 ltfssini.dtx v1.0d		1989-11-19 ltfssbas.dtx v1.0q	
General: <code>\xpt</code> added. . . . .	518	<code>\define@newfont</code> : Group added. . . . .	423
1989-04-27 ltfssbas.dtx v1.0g		<code>\wrong@fontshape</code> : Instead of calling <code>\family\default@family</code> , etc. we directly set <code>\f@family</code> , etc. . . . .	428
General: Documentation revised. . . . .	410	1989-11-22 ltfssbas.dtx v1.0r	
1989-04-27 ltfssini.dtx v1.0e		<code>\math@version</code> : <code>\def</code> → <code>\edef</code> for <code>\math@version</code> . . . . .	421
General: Definitions of L <sup>A</sup> T <sub>E</sub> X symbols corrected. . . . .	518	1989-11-25 ltfssbas.dtx v1.0s	
1989-04-29 ltfssbas.dtx v1.0h		General: All <code>\edef\font@name</code> changed to <code>\xdef\font@name</code> . Necessary after introduction of <code>\begingroup/\endgroup</code> in v1.0q. . . . .	410
General: Documented problem with <code>\halign</code> , and <code>\noalign</code> . . . . .	410	extra// → + in <code>\extra@def</code> . . . . .	410

1989-11-26 ltfssbas.dtx v1.0t	1990-01-25 ltfssini.dtx v1.1e
<code>\select@group</code> : <code>\bgroup</code> / <code>\egroup</code>	<code>\nfss@text</code> : Macro added. . . . . 541
changed to	1990-01-27 ltfssbas.dtx v1.2d
<code>\begingroup</code> / <code>\endgroup</code> to avoid	<code>\DeclarePreloadSizes</code> : Font identifier
empty Ord atom on math list. . . 430	set to <code>\relax</code> . . . . . 416
1989-12-02 ltfssini.dtx v1.1b	1990-01-28 ltfssbas.dtx v1.2e
General: <code>\rmmath</code> renamed to	<code>\mathgroup</code> : <code>\newfam</code> let to
<code>\mathrm</code> . . . . . 518	<code>\new@mathgroup</code> . . . . . 410
1989-12-03 ltfssini.dtx v1.1c	1990-01-28 ltfssbas.dtx v1.2f
General: Some internal macros	<code>\define@newfont</code> : Added call to
renamed to make them	<code>\curr@fontshape</code> macro to allow
inaccessible. . . . . 518	substitution. . . . . 423
1989-12-05 ltfssbas.dtx v1.0u	<code>\wrong@fontshape</code> : Warning message
<code>\addto@hook</code> : <code>\addto@hook</code> added. . 435	slightly changed. . . . . 428
1989-12-05 ltfssstrc.dtx v1.0u fam.dtx	1990-01-28 ltfssini.dtx v1.2b
<code>\every@math@size</code> : Hook <code>\every@size</code>	<code>\em</code> : Call to <code>\@nomath</code> added. . . . . 538
added. . . . . 467	1990-02-08 ltfssini.dtx v1.1g
1989-12-13 ltfssstrc.dtx v1.0f	General: Protected the commands
<code>\use@mathgroup</code> : <code>\expandafter</code> added	<code>\family</code> , <code>\series</code> , <code>\shape</code> , <code>\size</code> ,
before final <code>\fi</code> . . . . . 470	<code>\selectfont</code> , and <code>\mathversion</code> . 518
1989-12-16 ltfssbas.dtx v1.1a	1990-02-16 ltfssbas.dtx v1.2g
<code>\select@group</code> : <code>\relax</code> in front	General: Support for changes of
added. . . . . 430	<code>\baselineskip</code> without changing
Now four arguments. . . . . 430	the size. . . . . 410
Redefinition of alphabet now	<code>\math@version</code> : <code>\@nomath</code> added. . . 421
simpler. . . . . 431	1990-02-18 ltfssstrc.dtx v1.0j
Usage of ‘=’ macro added. . . . . 431	<code>\selectfont</code> : Redefine unprotected
1989-12-16 ltfssstrc.dtx v1.1a	version <code>\p@selectfont</code> instead of
<code>\selectfont</code> : Changed order of calls. 462	<code>\selectfont</code> . . . . . 462
<code>\use@mathgroup</code> : Redefinition of	1990-03-14 ltfssstrc.dtx v1.0k
alphabet now simpler. . . . . 469	General: Added code for TeX3. . . . . 458
Usage of ‘=’ macro added. . . . . 469	<code>\extract@font</code> : Added code for
1990-01-18 ltfssstrc.dtx v1.0h	TeX3. . . . . 461
General: <code>\tracingfonts</code> meaning	1990-03-30 ltfssbas.dtx v1.2h
changed. . . . . 458	<code>\math@egroup</code> : Changed to have one
1990-01-20 ltfssbas.dtx v1.2a	arg. . . . . 433
<code>\math@bgroup</code> : Def. placed in this	1990-03-30 ltfssstrc.dtx v1.2h
file. . . . . 433	<code>\use@mathgroup</code> : Third argument
<code>\math@egroup</code> : Def. placed in this	removed (see <code>\math@egroup</code> ). . . . 469
file. . . . . 433	1990-04-01 ltfssbas.dtx v1.2i
<code>\select@group</code> : Def for alph id	General: Code added from
changed. . . . . 431	tracefnt.dtx. . . . . 410
1990-01-21 ltfssbas.dtx v1.2b	Support for TeX3. . . . . 410
<code>\select@group</code> : Code moved to	1990-04-01 ltfssstrc.dtx v1.0l
<code>\use@mathgroup</code> . . . . . 431	General: Part of code moved to
1990-01-21 ltfssstrc.dtx v1.2b	fam.dtx. . . . . 458
<code>\use@mathgroup</code> : Macro added to	<code>\tracingfonts</code> : Check if
allow cleaner interface. . . . . 469	<code>\tracingfonts</code> already defined. . 459
1990-01-23 ltfssbas.dtx v1.2c	1990-04-01 ltfssstrc.dtx v1.0o
General: <code>\no@version@warning</code>	<code>\tracingfonts</code> : Check if
renamed to <code>\no@alphabet@error</code> . 410	<code>\tracingfonts</code> defined removed
Macro <code>\no@alphabet@help</code> added 410	again. . . . . 459
<code>\no@alphabet@error</code> : Changed to	
error call . . . . . 410	

1990-04-02 ltfssini.dtx v1.1i	1991-08-14 ltpictur.dtx LaTeX2.09
General: <code>\input</code> of files now handled by docstrip. . . . . 518	General: (RmS) inserted extra braces around entry for NFSS . . . . . 716
1990-04-05 ltfssstrc.dtx v1.0m	1991-08-14 ltthm.dtx LaTeX2.09
<code>\selectfont</code> : Call <code>\tracingon</code> only if <code>\tracingfonts</code> greater than 3. . . 462	<code>\endtheorem</code> : Moved <code>\itshape</code> after <code>\item</code> to make it work with NFSS 746
1990-05-05 ltfssstrc.dtx v1.0n	1991-08-26 ltfssini.dtx v1.1n
<code>\selectfont</code> : <code>\tracingon</code> with new syntax. . . . . 462	<code>\reset@font</code> : Macro introduced . . . 541
1990-06-23 ltfssini.dtx v1.1k	1991-08-26 ltmiscen.dtx LaTeX2.09
<code>\nfss@text</code> : Changed to <code>\mbox</code> . . . . 541	<code>\verbatim</code> : <code>\@@par</code> added . . . . . 633
1990-06-24 ltfssbas.dtx v1.2j	1991-08-26 ltpictur.dtx LaTeX2.09
<code>\DeclarePreloadSizes</code> : Missing percent added. . . . . 416	<code>\endpicture</code> : (RmS & FMi) extra boxing level around <code>\@picbox</code> to guard against unboxing in math mode (proposed by John Hobby) 714
1990-06-24 ltfssstrc.dtx v1.0o	1991-08-26 ltplain.dtx LaTeX2.09
<code>\baselinestretch</code> : Moved to tracefnt.dtx. . . . . 467	<code>\tracingall</code> : Added <code>\errorcontextlines=\maxdimen</code> , suggested by J. Schrod . . . . . 35
<code>\getanddefine@fonts</code> : <code>\Adding</code> tracing code. . . . . 471	1991-09-29 ltboxes.dtx LaTeX2.09
<code>\Macro</code> moved from fam.dtx. . . . . 470	<code>\mpfootnotetext</code> : (RmS) added <code>\reset@font</code> . . . . . 682
Adding debug code. . . . . 470	1991-09-29 ltfloat.dtx LaTeX2.09
<code>\use@mathgroup</code> : Tracing code added. 470	<code>\@footnotetext</code> : (RmS) added <code>\reset@font</code> . . . . . 779
1990-06-30 ltfssbas.dtx v1.2l	1991-09-29 ltmath.dtx LaTeX2.09
<code>\showhyphens</code> : Macro added. . . . . 433	<code>\@eqnnum</code> : RmS: <code>\reset@font</code> added. 648
1990-06-30 ltfssstrc.dtx v1.0p	1991-09-29 ltsect.dtx LaTeX2.09
<code>\use@mathgroup</code> : Added <code>\relax</code> after math group number. . . . . 470	<code>\@dottedtocline</code> : (RmS) added <code>\reset@font</code> for page number . . 758
1990-07-07 ltfssstrc.dtx v1.0q	1991-10-17 ltctrl.dtx LaTeX2.09
<code>\getanddefine@fonts</code> : Group number added to tracing. . . . . 471	<code>\@tfor</code> : (RmS) <code>\xdef</code> replaced by <code>\def</code> (See FMi's array.doc) . . . . . 280
<code>\math@egroup</code> : Tracing code added. 470	1991-10-25 ltbibl.dtx LaTeX2.09
<code>\use@mathgroup</code> : Group number added to tracing. . . . . 470	<code>\@citex</code> : added <code>\reset@font</code> , suggested by Bernd Raichle. . . . 788
1990-08-27 ltfssstrc.dtx 1.0r	1991-11-01 ltfloat.dtx LaTeX2.09
<code>\type@restoreinfo</code> : Some extra tracing info. . . . . 466	<code>\footnote</code> : (RmS) Added <code>\let\protect\noexpand</code> in <code>\footnote</code> , <code>\footnotemark</code> , and <code>\footnotetext</code> , since <code>\xdef</code> is used . . . . . 779
1990-08-27 ltfssstrc.dtx v1.0r	1991-11-04 ltlists.dtx LaTeX2.09
<code>\getanddefine@fonts</code> : Correcting missing name after <code>\tracingon</code> . . 470	<code>\makelabel</code> : (RmS) added default definition for <code>\makelabel</code> , to produce an error message. . . . . 667
1991-03-28 ltfssini.dtx v1.1m	1991-11-04 ltplain.dtx RmS
<code>\copyright</code> : Extra braces added. . . 541	General: Removed <code>\itemitem</code> since never needed/useful with L <sup>A</sup> T <sub>E</sub> X. . 33
1991-03-30 ltfssini.dtx v1.2g	1991-11-06 ltbibl.dtx LaTeX2.09
<code>\newfont</code> : Definition added. . . . . 540	<code>\@citex</code> : added code to remove a leading blank . . . . . 788
<code>\symbol</code> : Definition added. . . . . 540	
1991-07-24 ltmiscen.dtx LaTeX2.09	
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1991-11-13 ltbib1.dtx LaTeX2.09	avoid conflicts with other channels allocated by <code>\newread</code> . . . . .	80
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1991-11-21 ltfssini.dtx v1.1o	<code>\@xympar</code> : (RmS) added	
<code>\reset@font</code> : Added extra braces for robustness. . . . .	<code>\global\@ignorefalse</code> . . . . .	774
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1991-11-22 ltfloat.dtx LaTeX2.09	<code>\@esphack</code> to <code>\@Esphack</code> . . . . .	768
<code>\footnote</code> : (RmS) Added	1992-03-18 ltlists.dtx 0.0	
<code>\let\protect\noexpand</code> in	<code>\trivlist</code> : RmS: added	
<code>\@xfootnote</code> , <code>\@xfootnotemark</code> , and <code>\@xfootnotetext</code> . . . . .	<code>\@nmbrlistfalse</code> . . . . .	663
1991-11-22 ltlists.dtx LaTeX2.09	1992-03-18 ltmiscen.dtx LaTeX2.09	
<code>\@item</code> : (RmS) Changed second call to <code>\makelabel</code> to	<code>\begin</code> : Changed <code>\@ignoretrue</code> to <code>\@ignorefalse</code> (as documented) . . . . .	625
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1991-11-27 ltfssbas.dtx v1.3a	General: Renamed <code>\text</code> to <code>\nfss@text</code> to make it internal. . . . .	518
General: All <code>\family</code> , <code>\shape</code> etc. renamed to <code>\fontfamily</code> etc. . . . .	1992-05-12 ltfssbas.dtx v1.3c	
1991-11-27 ltfssini.dtx v1.2a	<code>\extract@alph@from@version</code> : Macro added. . . . .	432
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<code>\@bibitem</code> : Changed <code>\c@enumiv</code> to <code>\value of \@listctr</code> . . . . .	<code>\DeclareFontShape</code> . . . . .	411
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1992-01-10 ltthm.dtx LaTeX2.09	<code>\select@group</code> : . . . . .	431
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1992-01-14 ltbib1.dtx LaTeX2.09	<code>\wrong@fontshape</code> : . . . . .	428
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1992-08-24 ltdefs.dtx LaTeX2.09		1993-03-18 ltffsbas.dtx v2.0c	
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1992-08-24 ltmiscen.dtx LaTeX2.09		1993-03-18 ltfsstrc.dtx v2.1b	
<code>\begin:</code> Added code to <code>\begin</code> to remember line number. Used by <code>\@badend</code> to display position of non-matching <code>\begin.</code> . . . . .	625	General: Changed all <code>\@tempdima</code> in <code>\@tempdimb</code> to avoid killing <code>\numberline</code> . . . . .	458
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<code>\@array:</code> Changed <code>\par</code> to <code>\@empty</code> to avoid starting new row e.g. after <code>\hline</code> . . . . .	699	<code>\@latexerr:</code> Remove setting of errorcontextlines . . . . .	287
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1992-09-22 ltfsstrc.dtx v2.1a		1993-07-17 ltoutenc.dtx 1.0d	
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1992-11-23 ltcounts.dtx LaTeX2.09		1993-08-05 ltpictur.dtx LaTeX2.09	
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1992-11-26 ltboxes.dtx LaTeX2.09		1993-08-05 ltsect.dtx LaTeX2.09	
<code>\@mpfootnotetext:</code> (RmS) added protection for <code>\edef</code> . . . . .	682	<code>\@sect:</code> (RmS) Made sure that <code>\protect</code> works correctly in expansion of <code>\the</code> counter . . . .	751
1992-11-26 ltfloat.dtx LaTeX2.09		1993-08-05 ltspc.dtx LaTeX2e	
<code>\@footnotetext:</code> (RmS) added protection for <code>\edef</code> . . . . .	779	<code>\@hspace:</code> (RmS) Removed superfluous <code>\leavevmode</code> in <code>\@hspace</code> and <code>\@hspace,</code> as suggested by CAR. . . . .	329

1993-08-05 lttab.dtx latex2e		
\ctabular*: Replaced		
\expandafter\def by \@namedef.	698	
1993-08-06 ltbibl.dtx LaTeX2.09		
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leading blanks are removed there		
as well.	788	
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1993-08-16 ltoutenc.dtx 1.0g		
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1993-09-02 ltfsstrc.dtx v2.1i		
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1993-09-03 ltmiscen.dtx LaTeX2.09		
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\@noligs by extensible list	638	
1993-09-07 ltmiscen.dtx LaTeX2.09		
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that it detects a missing second		
delimiter.	637	
1993-09-08 ltmiscen.dtx LaTeX2.09		
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1993-09-19 lterror.dtx LaTeX2.09		
\@invalidchar: (RmS) Error message		
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1993-11-02 ltmath.dtx LaTeX2.09		
General: RmS: Corrected description		
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accordingly and removed extra		
\tabskip assignment.	648	
1993-11-03 ltmath.dtx LaTeX2e		
General: RmS: Initialized \everycr to		
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1993-11-03 ltpictur.dtx LaTeX2.09		
General: (RmS) changed \halign to		
\ialign to initialize \tabskip and		
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1993-11-11 ltfsini.dtx v2.1a		
\normalfont: Macro added	541	
1993-11-11 ltfsstrc.dtx v2.2a		
General: Option concept added for		
LaTeX2e	458	
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\@currentextension	823	
\@reset@ptions: macro added	849	
\AtEndDocument: Included extension		
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\documentstyle: Added		
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\load@onefilewithoptions: Moved		
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\@declaredoptions here, from the		
end of \ProcessOptions.	843	
\NeedsTeXFormat: made more robust		
for alternative syntax for other		
formats.	840	
\ProcessOptions*: Optimize ‘empty		
option’ code.	835	
Stop adding the global option list		
inside class files.	835	
1993-11-14 ltdefs.dtx v0.2a		
\g@addto@macro: Made global	107	
1993-11-15 ltclass.dtx v0.2b		
\documentstyle: Modified to match		
\ProcessOption*	838	
\ProcessOptions*: Star form added.	835	
1993-11-17 ltclass.dtx v0.2c		
\@fileswith@ptions: Macro added	849	
\@badrequireerror: Macro added	851	
\@twoloadclasserror: Macro added	851	
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1993-11-22 ltdefs.dtx LaTeX2e		General: Removed <code>\xpt</code> stuff	541
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<code>\@plus: Macro added</code>	79	<code>\LaTeX: Macro changed</code>	331
<code>\CheckCommand: Macro added</code>	86	1993-11-28 ltclass.dtx v0.2h	
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1993-11-22 lterror.dtx LaTeX2e		General: Assorted commands now in	
<code>\c@errorcontextlines: Macro added</code>	287	the kernel removed.	822
1993-11-22 ltfiles.dtx LaTeX2e		Directory syntax checking moved to	
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<code>\@executeoption</code>	837	added	950
General: Various macros now moved		<code>\@makespecialcolbox: Command</code>	
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Warnings and errors now directly		1993-11-29 ltplain.dtx LaTeX2e	
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1993-11-23 ltdefs.dtx LaTeX2e		suggested by Paul Taylor	34
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1993-12-04 ltfilehook.dtx v0.9b		placement bug fixed . . . . .	941
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1993-12-04 ltfiles.dtx v0.9b		<code>\ProvidesFile</code> : Macro added . . . . .	832
<code>\@iinput</code> : Macro reimplemented . . .	349	1993-12-07 ltclass.dtx v0.2m	
<code>\@input</code> : Macro reimplemented . . .	350	<code>\load@onefilewithoptions</code> : Reset	
<code>\IfFileExists@</code> : Macro added . . . .	347	<code>\CurrentOption</code> . . . . .	843
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		General: Protected all special	
		characters with <code>\string</code> . . . . .	357

1993-12-07 ltoutenc.dtx v1.1	1993-12-11 ltmath.dtx v0.9g
General: Made all character numbers	General: Added a group around the
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<code>\@parboxto</code> : <code>\endgraf</code> added due to	<code>\title</code> : Added default . . . . . 747
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1993-12-08 ltspace.dtx LaTeX2e	<code>\@docclearpage</code> : defs changed to
<code>\@bsphack</code> : Command reimplemented 319	<code>lets</code> . . . . . 948, 949
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<code>\@vbsphack</code> : Command added . . . . . 322	minimal . . . . . 989
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<code>\@irsbox</code> : fix another typo . . . . . 684	<code>lets</code> . . . . . 959, 960
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<code>\enddocument</code> : Hook added . . . . . 619	<code>\errorcontextlines</code> (now in
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  - General: Corrected file name in driver code. .... 354
- 1993-12-13 `lftab.dtx` latex2e
  - `\tabbing`: Removed optional argument of `\item` ..... 693
- 1993-12-14 `ltoutput.dtx` v1.0i
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- 1993-12-15 `ltboxes.dtx` v0.1d
  - `\iminipage`: Changed default from ‘c’ to ‘s’ ..... 681
  - `\iparbox`: Changed default from ‘c’ to ‘s’ ..... 678
  - `\minipage`: Changed default from ‘c’ to ‘s’ ..... 680
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- 1993-12-15 `ltclass.dtx` v0.2p
  - General: Removed extra ‘s’ from `@@warnings` ..... 822
- 1993-12-16 `ltlogos.dtx` LaTeX2e
  - `\LaTeXe`: Extended logo by DPC .. 331
- 1993-12-16 `ltmath.dtx` v0.9i
  - `\@eqnocr`: use `\refstepcounter` instead of shortcut ..... 650
  - General: use `\refstepcounter` instead of shortcut ..... 648
- 1993-12-16 `ltmiscen.dtx` v0.9i
  - General: `\literal` added ..... 638
- 1993-12-16 `ltpage.dtx` LaTeX2e
  - `\mark`: Init `\mark` at begin document 816
- 1993-12-16 `ltspace.dtx` LaTeX2e
  - `\@bsphack`: Corrected optimisation ;-) 319
- 1993-12-16 `lftab.dtx` latex2e
  - `\@xhline`: Measure from middle of vertical rules ..... 708
- 1993-12-17 `ltclass.dtx` v0.2q
  - `\@documentclasshook`: Macro added 822
  - `\@fileswithoptions`: Add `\@compatibility` hook ..... 841
  - `\documentstyle`: Match Alan’s new code. .... 838
- 1993-12-17 `ltoutenc.dtx` 1.3
  - General: Added this section ..... 358
  - Removed all the hackery for use in `\DeclareFontEncoding`, and redid everything using `\DeclareTextFoo`. .... 370, 372
- Removed the catcode hackery, since the file is only read as a package in the preamble, and removed all the messages on the screen, which just confuse users. Replaced them by the appropriate `\ProvidesPackage` commands. Added `XXXenc`. ... 357
- 1993-12-17 `ltoutenc.dtx` v1.3
  - General: Added `\EncodingSpecificAccent`, `\EncodingSpecificAccentedLetter` and `\EncodingSpecificCommand`. 354
  - Made Rokicki’s encoding a proper encoding scheme rather than a variant of OT1. .... 354
- 1993-12-17 `ltoutput.dtx` v1.0j
  - `\@opcol`: Hook removed ..... 949
  - `\@specialoutput`: Page room test added ..... 944
  - `\@topnewpage`: check for vsize too small added ..... 941
  - Page room test added ..... 943
  - `\@writsetup`: —and then removed 953
  - `\fl@tracemessage`: tracefloatvals made a document command ... 985
- 1993-12-17 `ltpage.dtx` LaTeX2e
  - `\mark`: Removed init `\mark` at begin document, since it doesn’t work. 816
  - `\rightmark`: Stopgap solution to mark `\leftmark` and `\rightmark` work without initializing mark until the problem is solved. .... 816
- 1993-12-18 `ltoutenc.dtx` 1.3b
  - General: Fixed typos with `\ProvidesPackage` lines. Added the `\NeedsTeXFormat` line. Added the last argument to `\DeclareEncoding`. Moved the use of the encodings to after their declaration. .... 357
  - Replaced the missing last argument to `\DeclareFontEncoding`. 370, 372
- 1993-12-18 `ltoutenc.dtx` 1.3c
  - General: Rewrote for the new syntax of `\EncodingSpecific`. ... 370, 372
  - Split `\EncodingSpecificAccent` up into `\EncodingSpecific` and `\DeclareAccent`. .... 358
- 1993-12-18 `ltoutenc.dtx` v1.3a
  - General: Replaced OT3 by XXX .. 354
- 1993-12-18 `ltoutenc.dtx` v1.3b
  - General: Corrected typos. .... 354
  - Replaced the missing last argument to `\DeclareFontEncoding`. .... 354



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1993-12-18 ltoutenc.dtx v1.3d	Wrapped long lines to column 72 . . . 822
General: Some T1 stuff had drifted into the OT1 file. . . . . 354	<code>\load@onefile@withoptions</code> : Modify to reduce parameter stack usage . . 846
1993-12-18 ltpage.dtx LaTeX2e	1994-01-17 ltfiles.dtx LaTeX2e
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1993-12-19 ltclass.dtx v0.2r	1994-01-17 ltfssbas.dtx v2.1a
<code>\endfilecontents</code> : Different message when ignoring a file . . . . . 851	General: New math font setup . . . . 410
1993-12-19 ltfntcmd.dtx v3.0b	<code>\curr@math@size</code> : New math font setup . . . . . 422
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Some more tidying done . . . . . 570	<code>\math@version</code> : New math font setup . 421
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1993-12-19 ltspace.dtx LaTeX2e	<code>\check@mathfonts</code> : New math font setup . . . . . 468
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1993-12-20 ltdefs.dtx LaTeX2e	<code>\restglb@settings</code> : New math font setup . . . . . 469
<code>\@reargdef</code> : Kept old version of <code>\@reargdef</code> , for array.sty . . . . . 83	1994-01-18 ltbibl.dtx LaTeX2e
1993-12-20 ltfiles.dtx v0.9m	<code>\bibliography</code> : Use <code>\@input@</code> so include files are listed. . . . . 788
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1994-01-05 fontdef.dtx v2.1d	<code>\@ifclassloaded</code> : Fix typo <code>\@pkgetension</code> . . . . . 827
General: Removed nf prefix from file names. . . . . 548	1994-01-18 ltfilehook.dtx v0.9p
1994-01-13 ltmath.dtx v0.9o	<code>\unqu@tefilef@und</code> : New Definition . 885
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1994-01-14 ltdirchk.dtx v0.2d	<code>\@input</code> : do not use a different definition for <code>\input@path</code> . . . . 350
<code>\IfFileExists</code> : Close the texsys.aux output stream . . . . . 10	<code>\@input@</code> : Macro added . . . . . 350
1994-01-15 ltfiles.dtx v0.9o	<code>\IfFileExists@</code> : New Definition . . . 347
<code>\document</code> : move <code>\@preamblecmds</code> after document hook . . . . . 336	<code>\includeonly</code> : Use <code>\@input@</code> so include files are listed. . . . . 340
	1994-01-18 ltfssini.dtx v2.1f
	<code>\not@math@alphabet</code> : Message corrected . . . . . 539
	1994-01-18 ltmiscen.dtx v0.9p
	<code>\@verbatim</code> : Add <code>\global\@inlabelfalse</code> . . . . . 633

Only add <code>\penalty</code> if in hmode .	633	<code>\restgbl@settings</code> : Correct trace info placement . . . . .	469
1994-01-19 fontdef.dtx v2.1e		1994-01-27 ltfntcmd.dtx v3.1a	
General: Added missing setting for symbols in bold version. . . . .	553	<code>\nocorrlist</code> : Only <code>.</code> , used as default for cm fonts . . . . .	577
1994-01-19 ltdirchk.dtx v0.2e		1994-01-29 ltclass.dtx v0.2v	
<code>\IfFileExists</code> : name changed from <code>\test</code> . . . . .	9	<code>\@unprocessedoptions</code> : Macro added. . . . .	851
<code>\input@path</code> : No longer check that an empty group is in the path . . . . .	11	<code>\load@onefile@withoptions</code> : All options raise error if no <code>\ProcessOptions</code> appears . . . . .	847
<code>\strip@prefix</code> : name changed from <code>\strip@meaning</code> , to match NFSS. . . . .	5	1994-01-31 ltdefs.dtx v0.2w	
1994-01-19 ltmath.dtx v1.0n classes		<code>\g@addto@macro</code> : Use toks register to avoid ‘hash’ problems . . . . .	107
<code>\mathindent</code> : Deferred setting of <code>\mathindent</code> . . . . .	651	1994-01-31 ltfiles.dtx v0.9t	
1994-01-20 ltdirchk.dtx v0.2f		<code>\document</code> : set <code>\@normalsize</code> or <code>\normalsize</code> if necessary . . . . .	335
General: <code>\@copytexsys</code> and the <code>texsys.new</code> file removed . . . . .	9	1994-01-31 ltfntcmd.dtx v3.1b	
Modify all of <code>ltxcheck</code> . . . . .	14	General: <code>\@normalsize</code> no longer defined . . . . .	570
<code>\IfFileExists</code> : <code>\@copytexsys</code> removed . . . . .	10	1994-02-01 ltpage.dtx LaTeX2e	
1994-01-21 ltclass.dtx v0.2u		<code>\pagestyle</code> : (DPC) Modify to get nicer error message . . . . .	813
<code>\documentstyle</code> : compatibility file now <code>latex209.def</code> . . . . .	838	<code>\thispagestyle</code> : (DPC) Modify to get nicer error message . . . . .	814
1994-01-21 ltdirchk.dtx v0.2g		1994-02-02 ltclass.dtx v0.2x	
General: Improve documentation, reorganize <code>docstrip</code> module . . . . .	1	<code>\load@onefile@withoptions</code> : Only run the hook and options check if the file was loaded. . . . .	847
<code>\filename@parse</code> : Minor changes, and add Mac version ( <code>:</code> ) . . . . .	11	1994-02-03 ltoutput.dtx v1.0k	
<code>\today</code> : Name changed from <code>\stamp</code> , to save memory . . . . .	9	<code>\@makespecialcolbox</code> : correct mistakes in the documentation . . . . .	952
1994-01-21 ltfloat.dtx LaTeX2e		1994-02-07 ltclass.dtx v0.2y	
<code>\xfloat</code> : Added missing percent characters. . . . .	764	<code>\@fileswithoptions</code> : Run <code>\@compatibility</code> on the first class to start (not the first to finish) . . . . .	841
1994-01-21 ltmiscen.dtx v0.9s		<code>\@ifclasswith</code> : Add extra <code>,s</code> so ‘two’ is not matched with ‘twocolumn’ . . . . .	829
<code>\verbatim@font</code> : Removed unnecessary category code hackery. . . . .	634	<code>\ProcessOptions*</code> : Add extra <code>,s</code> so ‘two’ is not matched with ‘twocolumn’ . . . . .	835
1994-01-24 ltdirchk.dtx v0.2h		1994-02-07 ltfssbas.dtx v2.1c	
<code>\IfFileExists</code> : Stop testing once <code>texsys.aux</code> has been found . . . . .	10	<code>\DeclareFontEncoding</code> : revert catcode settings earlier . . . . .	414
1994-01-24 ltpage.dtx LaTeX2e		<code>\DeclareFontShape@</code> : revert catcode settings earlier . . . . .	411
<code>\pagestyle</code> : (DPC) Complain if <code>pagestyle</code> is undefined. . . . .	813	1994-02-08 ltoutput.dtx v1.0k	
1994-01-25 ltdirchk.dtx v0.2i		<code>\@makespecialcolbox</code> : <code>boxmaxdepth</code> setting added . . . . .	952
General: Protect against looping on <code>\@input</code> and <code>\@end</code> . . . . .	3	<code>boxmaxdepth</code> setting removed . . . . .	951
1994-01-25 ltfssbas.dtx v2.1b		General: Documentation and tasks tidied. . . . .	926
<code>\math@version</code> : Corrections for math setup . . . . .	421		
1994-01-25 ltmath.dtx LaTeX2e			
<code>\bordermatrix</code> : Removed <code>\p@renwd</code> . . . . .	643		
1994-01-26 ltfsssrc.dtx v2.3c			
<code>\check@mathfonts</code> : Correct trace info placement . . . . .	468		



1994-02-10 ltclass.dtx v0.2z	1994-03-07 ltboxes.dtx v0.1a
\@documentclasshook: Changed the name from \@compatibility to \@documentclasshook, and added the check for whether \@normalsize has been defined. ASAJ. . . . . 822	\@mpfootnotetext: Extra group for color . . . . . 682
\@fileswithoptions: Renamed \@compatibility to \@documentclasshook. ASAJ. . . 841	1994-03-07 ltboxes.dtx v1.0a
1994-02-10 ltssbas.dtx v2.1d	General: Unify format with other Kernel files . . . . . 671
\addto@hook: Made \addto@hook long. . . . . 435	1994-03-07 ltdefs.dtx v1.0a
1994-02-10 ltsscmp.dtx v2.1d	\@italiccorr: Macro added . . . . . 79
\scan@fontshape: scan away stuff after pt . . . . . 484	1994-03-07 ltfiles.dtx v1.0a
1994-02-22 ltssini.dtx v2.1g	General: Initial version, split from latex.dtx . . . . . 332
General: Correct error message . . . . 543	Long lines wrapped to 72 columns 332
1994-02-24 ltssbas.dtx v2.1e	1994-03-07 ltfinal.dtx v0.1a
\DeclareFontShape: Separate restoration of catcodes for fd cmds . . . . . 411	General: Add code from the old dump.dtx . . . . . 1017
\define@newfont: Separate restoration of catcodes for fd cmds . . . . . 424	Initial version, split from latex.dtx 1003
\nfss@catcodes: Separate restoration of catcodes for fd cmds . . . . . 424	move code here from lhyphen.dtx 1009
1994-02-25 ltdirchk.dtx v0.2j	Remove oldcomments environment . . . . . 1003
General: Remove need for drv file . . . . 1	use \InputIfFileExists not \IfFileExists . . . . . 1009
1994-03-01 ltdirchk.dtx v0.2k	1994-03-07 ltfloat.dtx v1.0a
General: Add unstripped module, so that dircheck.dtx may be used with initex . . . . . 1	\@endfloatbox: (DPC) Extra group for colour . . . . . 769
1994-03-02 ltboxes.dtx v0.1e	\@footnotetext: (DPC) Extra group for colour . . . . . 779
General: Add 2kernel module . . . . . 671	\@xfloat: (DPC) Extra group for colour . . . . . 765
Remove need for drv file . . . . . 671	1994-03-07 lthyphen.dtx v0.1c
1994-03-02 ltclass.dtx v0.3a	General: move the 2kernel code to ltfinal.dtx . . . . . 1001
General: Remove need for driver file 822	1994-03-07 ltlength.dtx v1.0a
1994-03-03 ltboxes.dtx v0.1f	\@settodim: (DPC) Extra group for colour . . . . . 408
\@irsbox: Replaced a missing \else 684	1994-03-07 ltlists.dtx v1.0a
1994-03-04 ltfloat.dtx v1.0a	General: Initial version, split from latex.dtx . . . . . 655
General: Initial version, split from latex.dtx . . . . . 760	Long lines wrapped to 72 columns 655
1994-03-04 ltsect.dtx v1.0a	1994-03-07 ltpage.dtx v1.0a
General: Initial version, split from latex.dtx . . . . . 747	General: Initial version, split from ltherest.dtx . . . . . 813
1994-03-04 lttab.dtx v1.0a	1994-03-07 ltpictur.dtx v0.1a
General: Initial version, split from latex.dtx . . . . . 686	General: Initial version, split from latex.dtx . . . . . 711
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	1994-03-07 lttab.dtx v1.0a
	General: Long lines wrapped to 72 columns . . . . . 686
	1994-03-08 ltclass.dtx v0.3b
	General: Modify driver code into ‘new style’ . . . . . 822

1994-03-08 ltdirchk.dtx v1.0a		<code>\listfiles</code> : Reset <code>\@addtofilelist</code> at begin document . . . . .	353
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1994-03-08 ltplain.dtx v1.0a		1994-03-13 ltssbas.dtx v2.1g	
General: Remove need for a driver file. . . . .	15	General: add 2kernel module to omit repeated code . . . . .	410
1994-03-10 ltssbas.dtx v2.2f		1994-03-13 ltssdcl.dtx v2.1c	
<code>\math@egroup</code> : Changed		General: add 2kernel module to omit repeated code . . . . .	488
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1994-03-12 ltclass.dtx v0.3c		<code>\lrbox</code> : Use <code>\color@setgroup</code> . . . . .	675
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<code>\@yargd@f</code> : Name changed from <code>\XXX@argdef</code> . . . . .	83	<code>\color@endgroup</code> . . . . .	769
1994-03-12 ltdirchk.dtx v1.0b		<code>\@footnotetext</code> : (DPC) Use	
General: Change name from dircheck.dtx . . . . .	1	<code>\color@begingroup</code> , add <code>\endgraf</code> . . . . .	779
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1994-03-12 ltfloat.dtx v1.0b		<code>\color@begingroup</code> . . . . .	773
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<code>\@xympar</code> : (DPC) Extra bgroup for colour . . . . .	774	<code>\color@begingroup</code> . . . . .	765
1994-03-12 ltplain.dtx v1.0b		1994-03-15 ltfiles.dtx LaTeX2e	
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1994-03-12 ltplain.dtx v1.0e		1994-03-15 ltfntcmd.dtx v3.2a	
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1994-03-13 ltcntrl.dtx v1.0c		Changed <code>\/</code> to <code>\@@italiccorr</code> . . . . .	570
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1994-03-28 ltthm.dtx v1.0a				
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1994-04-15 ltboxes.dtx v1.0d			
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1994-04-17 ltthm.dtx v1.0c			
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1994-04-18 ltssbas.dtx v2.1i			
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removed again . . . . .	410		
<code>\calculate@math@sizes</code> : Changed			
message to log only . . . . .	433		
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error macro . . . . .	410		
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1994-04-18 ltssdcl.dtx v2.1d			
General: Removed surplus			
<code>\no@alphabet@error</code> (see			
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		1994-04-19 ltpage.dtx v1.0b	
		General: Improve documentation . .	813
		1994-04-20 ltfmtcmd.dtx v3.3a	
		General: Documentation up-dated .	570
		New implementation of <code>\nocorr</code> .	570
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		from list of tokens to check, leaving	
		only punctuation characters . . .	575
		1994-04-20 ltmiscen.dtx v1.0e	
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		Changed logic for producing	
		warning messages . . . . .	621
		1994-04-21 ltboxes.dtx v1.0e	
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		color . . . . .	681
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		1994-04-21 ltfinal.dtx v0.1c	
		General: Added comments, set the	
		catcodes of 128–255. . . . .	1003
		1994-04-22 ltssini.dtx v2.1g	
		<code>\not@math@alphabet</code> : Message	
		changed again . . . . .	539
		1994-04-23 ltfinal.dtx v0.1d	
		General: Check that <code>\font@submax</code> is	
		still zero . . . . .	1003
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		<code>\@resetfyps</code> : Number 2 changed to	
		<code>\tw@</code> . . . . .	989
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		<code>\@specialoutput</code> : Message changed to	
		give more info and ‘top’ removed	944
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		give more info . . . . .	943
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		be generated later . . . . .	942
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		<code>\normalsize</code> . . . . .	926
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		documentation. . . . .	926
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		aesthetic changes. . . . .	926
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		changed/corrected. . . . .	926
		1994-04-24 ltpictur.dtx v0.1b	
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		<code>\hbox to</code> in several cases . . . .	711

1994-04-25 ltclass.dtx v0.3h	Warning changed to info message in
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1994-04-25 ltfloat.dtx v1.0e	<code>\@activechar@info:</code>
<code>\@largefloatcheck</code> : Changed warning	<code>\@activechar@warning</code> changed to
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General: Changed warning messages 760	topnewpage case ..... 959
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1994-04-27 ltfstrc.dtx v2.3e	added: <code>\@emptycol</code> ..... 941
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1994-04-28 lterror.dtx v1.0j	changed to <code>2\baselineskip</code> .... 944
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1994-04-28 lterror.dtx v1.1c	<code>\@emptycol</code> ..... 944
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1994-04-28 ltssdcl.dtx v2.1e	Extra empty column added for
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1994-04-28 ltpictur.dtx v0.1c	<code>3\baselineskip</code> ..... 943
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1994-04-28 ltplain.dtx v1.0g	Documentation tidied. .... 926
General: Turn off overfull box tracing	Empty column action added. .... 926
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1994-04-29 ltclass.dtx v1.0a	<code>\@topnewpage</code> . .... 926
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<code>\@verbatim</code> : <code>\leavevmode</code> added .. 634	<code>\col@number</code> ..... 940
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1994-05-02 ltfinal.dtx v0.1e		<code>\@citex</code> : Set switch for warning and	
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1994-05-11 <code>ltoutenc.dtx</code> 1.5a		<code>\fontsize</code> : Redefined to use <code>\set@fontsize</code> . . . . .	420
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		General: Moved <code>\fontencoding</code> to <code>fam.dtx</code> . . . . .	518
		Moved <code>\fontfamily</code> to <code>fam.dtx</code> . . . . .	518
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		Moved <code>\mathversion</code> to <code>fam.dtx</code> . . . . .	518
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1994-05-12 ltfsstrc.dtx v2.3f	1994-05-13 ltfinal.dtx v1.0h
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1994-05-12 ltoutput.dtx v1.0p	1994-05-13 ltfntcmd.dtx v3.3g
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1994-05-13 ltboxes.dtx v1.0h	General: Remove File identification
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1994-05-13 ltcounts.dtx v1.0f	\DeclareFontEncoding: Init encoding
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General: (ASAJ) Added	\@contfield: Colour support . . . . . 692
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- 1994-05-14 ltffsstrc.dtx v2.3h  
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- 1994-05-14 ltoutenc.dtx 1.5d  
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- 1994-05-14 ltoutenc.dtx v1.5c  
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- 1994-05-15 ltffsbas.dtx v2.1o  
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- 1994-05-16 fontdef.dtx v2.1g  
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- 1994-05-16 ltalloc.dtx v1.1a  
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- 1994-05-16 ltcntrl.dtx v1.0a  
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- 1994-05-16 ltffsbas.dtx v2.1p  
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- 1994-05-16 ltlogos.dtx v1.1a  
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- 1994-05-16 ltmath.dtx v1.0k  
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- 1994-05-16 ltoutenc.dtx 1.5h  
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- 1994-05-16 ltoutenc.dtx v1.5f  
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- 1994-05-16 ltoutenc.dtx v1.5i  
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- 1994-05-16 ltoutput.dtx v1.0q  
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1994-05-20 ltmiscen.dtx v1.0m		<code>\GenericError</code> , <code>\GenericWarning</code>	
General: Use new warning commands	618	and <code>\GenericInfo</code> .	281
1994-05-20 ltoutput.dtx v1.0s		(ASAJ) Replaces <code>\string</code> by	
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General: Added setting of <code>\protect</code>		<code>\GenericError</code> : (DPC) Alternative	
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1994-05-20 ltsect.dtx v1.0c		1994-05-22 ltfloat.dtx v1.0i	
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General: (ASAJ) Made the error		1994-05-23 ltclass.dtx v1.0h	
commands robust.	281	<code>\NeedsTeXFormat</code> : Don't stop	
1994-05-21 ltfiles.dtx v1.0h		completely when format is wrong	840
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1994-05-21 ltlists.dtx v1.0f		possible	840
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General: Use new error commands	686	<code>\@activechar@info</code> : Added	
1994-05-21 ltxref.dtx v1.1b		<code>\MessageBreak</code>	953
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1994-05-22 ltclass.dtx v1.0f		General: Added <code>\MessageBreak</code> .	926
General: Use new warning and error		Changed resetting of <code>\protect</code> after	
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1994-05-22 ltdefs.dtx v1.1f		1994-05-24 ltterror.dtx v1.2e	
General: Use new warning and error		<code>\@latex@info@no@line</code> : Macro added	285
cmds	78	1994-05-24 ltterror.dtx v1.2f	
1994-05-22 ltterror.dtx v1.1e		General: (DPC) wrap long lines	281
General: (ASAJ) Replaced <code>bgroup</code> by		1994-05-24 ltfntcmd.dtx v3.3i	
<code>begingroup</code> in error messages, to		General: Tidying and typos fixed	570
stop extra mathords creeping into		1994-05-24 ltmiscen.dtx v1.0q	
math mode.	281	<code>\@currrentline</code> : Use <code>\@empty</code> as outer	
1994-05-22 ltterror.dtx v1.2a		default	629
General: (ASAJ) Made		1994-05-25 ltdirchk.dtx v1.0g	
<code>\GenericError</code> , <code>\GenericWarning</code>		<code>\filename@parse</code> : Mac parser had "	
and <code>\GenericInfo</code> robust.	281	typo for :	12
(ASAJ) Replaced <code>\</code> and tilde by		1994-05-25 ltfntcmd.dtx v3.3j	
<code>\MessageBreak</code> and <code>\space</code> .	281	General: Insertion of <code>\aftergroups</code> to	
(ASAJ) Replaced		implement <code>\nocorr</code> moved to the	
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1994-05-25 ltsect.dtx v1.0e	documentation . . . . . 570
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ASAJ: Removed <code>\dag</code> , <code>\ddag</code> . . . .	646	<code>\savemarbox</code> : (DPC/CAR) Extra box added for colour . . . . .	773
ASAJ: Renamed <code>\S</code> and <code>\P</code> to <code>\mathsection</code> and <code>\mathparagraph</code> and made them <code>\mathchardefs</code> . . . . .	646	<code>\setfps</code> : Macro added . . . . .	764
1994-10-29 ltoutenc.dtx v1.6c		<code>\xdblfloat</code> : Macros removed: <code>\dbflt</code> , <code>\xdblfloat</code> . . . . .	769
General: Added commands like <code>\dots</code> for use in text and math. . . . .	366	<code>\xfloat</code> : (DPC/CAR) Extra box added to remove colour resetting from vmode . . . . .	765
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1994-10-30 ltdefs.dtx v1.2c		Reset hook added . . . . .	765
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General: (CAR) <code>\@onelevel@sanitize</code> added . . . . .	78	<code>\fps@dbl</code> : Macro added . . . . .	764
1994-10-30 ltdefs.dtx v1.2f		1994-10-31 ltoutput.dtx v1.1a	
General: (DPC) <code>\newwrite</code> 's moved to ltfiles . . . . .	78	<code>\makecol</code> : (DPC/CAR) Colour resetting moved to here . . . . .	950
1994-10-30 ltmath.dtx v1.0n		<code>\topnewpage</code> : (DPC/CAR) Extra box added to remove colour resetting from vmode . . . . .	942
General: ASAJ: Moved the new commands to ltoutenc. . . . .	646	(DPC/CAR) Use <code>\color@begingroup</code> for colour . .	942
1994-10-30 ltoutenc.dtx v1.6d		(DPC/CAR) Use <code>\normalcolor</code> .	942
General: Added <code>\DeclareTextCompositeCommand</code> . . . .	354	1994-11-02 ltoutenc.dtx v1.6d	
Added <code>\textcircled</code> . . . . .	354, 368, 378	General: Wrapped lines longer than 70 characters. . . . .	354
Added <code>\t</code> . . . . .	368	1994-11-03 ltclass.dtx v1.0k	
Added math commands. . . . .	354	General: Move <code>\@missingfileerror</code> to ltfiles . . . . .	822
Added OML encoding. . . . .	354, 368		
Added the OML encoding. . . . .	379		
Made <code>\textless</code> and <code>\textgreater</code> come from OML. . . . .	368		
Moved math commands here from ltmath. . . . .	370		
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1994-11-03 ltdirchk.dtx v1.0i	1994-11-04 ltsect.dtx 1.0h
General: Generate an error if latex.ltx	\@sect: (ASAJ) Added
not used with clean initex . . . . . 1	\protected@edef. . . . . 751
1994-11-03 ltfiles.dtx v1.0j	General: (ASAJ) Added
\@missingfileerror: Move here from	\protected@xdef to \thanks. . . 747
ltclass . . . . . 350	1994-11-04 ltsect.dtx v1.0h
1994-11-04 ltboxes.dtx v1.0m	General: Added \protected@write to
\@mpfootnotetext: Added	\addtocontents. ASAJ. . . . . 757
\protected@edef. ASAJ. . . . . 682	\addcontentsline: Added
1994-11-04 ltdefs.dtx v1.2e	\protected@write to
General: Added	\addcontentsline. ASAJ. . . . . 756
\set@display@protect to	1994-11-04 lttab.dtx v1.0h
\typeout. ASAJ. . . . . 78	\@mkpream: (ASAJ) Added
Added commands for setting and	\@unexpandable@protect to
restoring \protect. ASAJ. . . . . 90	\@mkpream. . . . . 705
Rewrote protected short commands	\multicolumn: (ASAJ) added
using \x@protect. ASAJ. . . . . 88	\set@typeset@protect. . . . . 701
1994-11-04 lterror.dtx v1.2g	1994-11-04 ltxref.dtx v1.1d
General: Added	\label: (ASAJ)Added
\set@display@protect to	\protected@edef . . . . . 615
\Generic* commands. ASAJ. . . 281	(ASAJ)Added \protected@write 615
1994-11-04 ltfiles.dtx v1.0k	1994-11-05 ltboxes.dtx v1.0n
\nofiles: Added setting of	\@mpfootnotetext: Color resetting for
\protected@write, \makeindex	footnotes moved to endminipage:
and \makeglossary to \nofiles.	as for main page. . . . . 682
ASAJ. . . . . 339	\color@endbox: macro added for color
\protected@write: Macro added	support . . . . . 674
ASAJ. . . . . 339	\color@hbox: macro added for color
1994-11-04 ltfloat.dtx v1.1b	support . . . . . 674
\@footnotetext: (ASAJ) Added	\endminipage: Color resetting for
\protected@edef. . . . . 779	footnotes moved to here: as for
\footnotemark: Added	main page. . . . . 681
\protected@xdef to	1994-11-05 ltboxes.dtx v1.0o
\footnotemark. . . . . 780	\@mpfootnotetext: Color groups
1994-11-04 ltidxglo.dtx v1.1b	restored here. . . . . 682
\@wrglossary: Added	1994-11-05 ltfloat.dtx v1.1c
\protected@write to	\@dblflset: Add compatibility with
\@wrglossary. . . . . 785	old version of \xfloat. . . . . 763
\@wrindex: Added \protected@write	\@endfloatbox: Use new \color@hbox
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General: Removed \if@filesw from	\@footnotetext: Removed
\makeindex. . . . . 783	\normalcolor (again) . . . . . 779
\makeglossary: Removed \if@filesw	\@savemarbox: Use new \color@hbox
from \makeglossary. . . . . 784	concept. . . . . 773
1994-11-04 ltmiscen.dtx v1.0t	\@setfps: Add compatibility with old
\@writefile: Removed setting of	version of \xfloat. . . . . 764
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1994-11-04 ltoutenc.dtx v1.6f	version of \xfloat: but the
General: Added \_ . . . . . 369	arguments, provided at exorbitant
Added \mathunderscore. . . . . 370	cost, are now completely ignored 764
1994-11-04 ltpage.dtx v1.0e	Use new \color@hbox concept. . . 765
\markright: Added	\@xympar: Use new \color@hbox
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General: Added setting of		General: Fix <code>\nocite{*}</code> . . . . .	786
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1994-11-05 ltoutput.dtx v1.1b		<code>eqnarray</code> : Added value of <code>\parskip</code> to	
<code>\@topnewpage</code> : Use new <code>\color@hbox</code>		<code>\abovedisplayskip</code> to compensate	
concept. . . . .	942	for negative <code>\topsep</code> . . . . .	653
<code>\@writsetup</code> : Change protect		1994-11-10 ltoutput.dtx v1.1e	
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aux-files. . . . .	953	setting . . . . .	953
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1994-11-05 ltoutput.dtx v1.1c		General: (CAR) added patch to <code>\loop</code> . .	15
<code>\@begindvi</code> : Added macro . . . . .	957	<code>\iterate</code> : (CAR) added extra <code>\relax</code> .	31
<code>\@begindvibox</code> : Added macro . . . .	938	1994-11-11 ltspace.dtx v1.2a	
<code>\@writsetup</code> : Add new <code>\AtBeginDvi</code>		<code>\:</code> (DPC) Make robust . . . . .	316
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<code>\AtBeginDvi</code> : Added macro . . . . .	938	<code>\normalsize</code> : Added <code>\MessageBreak</code> .	578
1994-11-06 ltfssbas.dtx v2.1u		1994-11-12 ltlists.dtx v1.2b ltspace	
<code>\cf@encoding</code> : New macro . . . . .	420	<code>\endtrivlist</code> : Changed order of tests	
<code>\DeclareFixedFont</code> : Renamed		to make <code>\@noitemerror</code> correct:	
<code>\every@size</code> to		end of an era. . . . .	663
<code>\every@math@size</code> . . . . .	412	1994-11-12 ltmiscen.dtx v1.0u	
1994-11-06 ltfssini.dtx v2.2b		<code>center</code> : Changed end macro to <code>\def</code> :	
<code>\@setsize</code> : Use <code>\@typeset@protect</code> .	540	safer and consistent . . . . .	631
1994-11-06 ltfssstrc.dtx v2.3k		<code>flushleft</code> : Changed end macro to	
<code>\glb@currsz</code> : New implementation .	466	<code>\def</code> : safer and consistent . . . . .	632
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1994-11-07 ltfiles.dtx v1.0m		1994-11-13 ltspace.dtx v1.2c	
<code>\document</code> : Renamed <code>\every@size</code> to		<code>\addpenalty</code> : Recorrected error	
<code>\every@math@size</code> . . . . .	335	message . . . . .	324
1994-11-07 ltplain.dtx v1.0l		<code>\addvspace</code> : Recorrected error	
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1994-11-07 preload.dtx v2.1e		<code>\@begindvi</code> : Use normal box register:	
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2.09 equivalent (from ltpatch) . .	685	<code>\AtBeginDvi</code> concept . . . . .	953
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1994-11-09 ltfssbas.dtx v2.1v		<code>\@testfp</code> . . . . .	926
<code>\@vpt</code> : (DPC) macros added, from		1994-11-14 ltspace.dtx v1.2d	
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(DPC) reduce save stack usage		1994-11-14 lttab.dtx v1.0i	
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		added . . . . .	700



1994-11-16 fontdef.dtx v2.2h		1994-11-18 ltfsstrc.dtx v2.3m	
General: (DPC) Removed <code>\{</code> and <code>\}</code>	548	General: <code>\next</code> to <code>\reserved@f</code>	458
1994-11-17 ltboxes.dtx v1.0q		1994-11-18 ltmath.dtx v1.0p	
General: <code>\@tempa</code> to <code>\reserved@a</code>	671	<code>\phantom</code> : (DPC) colour support	641
1994-11-17 ltclass.dtx v1.0l		(DPC) use <code>\expandafter</code> instead of	
General: <code>\@tempa</code> to <code>\reserved@a</code>	818	<code>\next</code>	641
1994-11-17 ltctrl.dtx v1.0b		<code>\prime@s</code> : (DPC) use <code>\let@token</code>	
General: <code>\@tempa</code> to <code>\reserved@a</code>	277	instead of <code>\next</code> and	
1994-11-17 ltdefs.dtx v1.0g		<code>\expandafter</code> instead of <code>\nxt</code>	646
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1994-11-17 lterror.dtx v1.2h		1994-11-21 ltfloat.dtx v1.1f	
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1994-11-17 ltfiles.dtx v1.0n		minipage flag	769
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1994-11-17 ltfinal.dtx v1.0o		<code>\outer@nobreak</code>	769
General: <code>\@tempa</code> to <code>\reserved@a</code>	1003	<code>\@marginparreset</code> : Macro added	773
1994-11-17 ltfloat.dtx v1.1e		<code>\@savemarbox</code> : Added <code>\@setminipage</code>	
General: <code>\@tempa</code> to <code>\reserved@a</code>	760	etc	773
1994-11-17 ltfntcmd.dtx v3.3p		Added resetting of size and font	773
General: <code>\@tempa</code> to <code>\reserved@a</code>	570	Changed to <code>\color@vbox</code>	773
1994-11-17 ltfsbas.dtx v2.1w		Use <code>\@setnobreak</code> etc	773
General: <code>\@tempa</code> to <code>\reserved@a</code>	410	<code>\@setminipage</code> : Macro added	767
1994-11-17 ltssdcl.dtx v2.1m		<code>\@setnobreak</code> : Macro added	767
General: <code>\@tempa</code> to <code>\reserved@a</code>	488	<code>\@xfloat</code> : Added <code>\@setminipage</code>	765
1994-11-17 ltfsstrc.dtx v2.3l		Added resetting of size and font	765
General: <code>\@tempa</code> to <code>\reserved@a</code>	458	Changed to <code>\color@vbox</code> so that	
1994-11-17 ltmath.dtx v1.0o		large floats overflow at the	
General: <code>\@tempa</code> to <code>\reserved@a</code>	639	bottom	765
1994-11-17 ltmiscen.dtx v1.0v		Missing percents reinserted after 4,	
General: <code>\@tempa</code> to <code>\reserved@a</code>	618	8: these are not numbers.	764
1994-11-17 ltoutenc.dtx v1.6h		Use <code>\@setnobreak</code>	765
General: (DPC) <code>\@tempa</code> to		<code>\@xympar</code> : Changed to <code>\color@vbox</code>	774
<code>\reserved@a</code>	354	1994-11-21 ltoutput.dtx v1.1i	
1994-11-17 ltoutput.dtx v1.1h		<code>\@addtocurcol</code> : Added <code>\if@nobreak</code>	
General: <code>\@tempa</code> to <code>\reserved@a</code>	926	test before float box	968, 971
1994-11-17 ltpictur.dtx v1.0f		<code>\@specialoutput</code> : Added <code>\if@nobreak</code>	
General: <code>\@tempa</code> to <code>\reserved@a</code>	711	test	946
1994-11-17 ltsect.dtx v1.0i		<code>\@topnewpage</code> : Changed to	
General: <code>\@tempa</code> to <code>\reserved@a</code>	747	<code>\color@vbox</code>	942
1994-11-17 lttab.dtx v1.0j		1994-11-22 ltssdcl.dtx v2.1o	
General: <code>\@tempa</code> to <code>\reserved@a</code>	686	General: wrap long lines	488
1994-11-18 ltboxes.dtx v1.0r		1994-11-22 ltoutenc.dtx v1.6i	
<code>\color@vbox</code> : macro added for color		General: Corrected <code>\dots</code> so that	
support	674	there's no kerning in monowidth	
1994-11-18 ltfinal.dtx v1.0n		fonts.	354
General: re-allow slots 127–255	1015	Corrected typo with	
1994-11-18 ltfsbas.dtx v2.1x		<code>\mathunderscore</code> .	354
General: (DPC) use <code>\reserved@f</code> not		Fixed empty accents. Again.	354
<code>\next</code>	410	1994-11-24 ltdefs.dtx v1.2h	
1994-11-18 ltssdcl.dtx v2.1m		<code>\@newenv</code> : Added test for <code>\endgraf</code>	85
<code>\DeclareMathDelimiter</code> : (DPC)			
<code>\expandafter</code> instead of <code>\next</code>	510		

1994-11-25 ltplain.dtx v1.1f	1994-12-01 ltfinal.dtx v1.0p
General: (DPC) Comment out lots of	General: Renamed lthyphen.* to
obsolete code . . . . . 15	hyphen.*. . . . . 1003
1994-11-26 ltfloat.dtx v1.1b	1994-12-01 lthyphen.dtx v1.0g
\footnote: (ASAJ) Added	General: Rename lthyphen.ltx/cfg to
\protected@xdef. . . . . 779	hyphen.ltx/cfg . . . . . 1001
1994-11-28 ltcntrl.dtx v1.0c	1994-12-01 ltplain.dtx v1.1g
General: Documentation	General: (DPC) More doc changes . . 15
improvements . . . . . 277	1994-12-02 fontdef.dtx v2.2i
1994-11-30 ltfiles.dtx v1.0o	General: Commented out \ldots.
\@dofilelist: Macro added . . . . . 353	ASAJ. . . . . 546
\listfiles: Use \@dofilelist . . . 352	1994-12-02 ltffssini.dtx v2.2c
\nofiles: There is no	\copyright: \copyright is now in
\@gobblethree. . . . . 339	ltoutenc. ASAJ . . . . . 541
1994-11-30 ltffssbas.dtx v2.1y	1994-12-02 ltlists.dtx v1.0e
\fontshape: Use \@current@cmd in	\@trivlist: RmS: Added check for
\@enc@update. ASAJ. . . . . 419	looping . . . . . 662
1994-11-30 ltmath.dtx 1.0q	1994-12-02 ltoutenc.dtx 1.7b
General: ASAJ:	General: Redefined \a properly. . . . 366
\DeclareMathOperator moved to	1994-12-02 ltoutenc.dtx v1.7b
AMS <sub>TEX</sub> . . . . . 639	General: Fixed a bug with \a. . . . . 354
1994-11-30 ltmiscen.dtx v1.0w	1994-12-04 lthyphen.dtx v1.0h
\@enddocument@kernel@warnings:	General: Documentation edits for
(DPC) Do warnings even for	/1989 . . . . . 1001
\nofiles . . . . . 620	1994-12-05 ltoutenc.dtx v1.7c
\enddocument: (DPC) Use	General: Added braces to
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scheme. . . . . 366	\nfss@catcodes . . . . . 414
1994-11-30 ltoutenc.dtx v1.6g	\nfss@catcodes: Added tab char as
General: Removed new definitions of	well . . . . . 424
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since encoding-specific commands	General: Added \null and \sh@ft to
now expand in the mouth. . . . . 366	\b and \d. . . . . 354
1994-11-30 ltoutenc.dtx v1.7a	1994-12-08 lttab.dtx v1.0k
General: Added new code for	\@array: Add \tabularnewline . . . 699
encoding-specific commands.	\@tabularnewline: (DPC) Made it
These now expand in the mouth,	\relax . . . . . 700
which means that ligaturing and	1994-12-09 ltbibl.dtx v1.1d
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Always load the enc.def file, so that	use in preamble. . . . . 789
the default encoding for the	1994-12-10 ltfloat.dtx v1.1g
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Redefined \@changed@cmd to expand	temporarily . . . . . 763
in the mouth. . . . . 358	\@dblflset: Macro removed
Removed \@changed@x@mouth since	temporarily . . . . . 763
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1995-04-27 ltmiscen.dtx v1.0y <code>\enddocument</code> : <code>\@checkend</code> moved after hook . . . . .	619	1995-05-08 ltdefs.dtx v1.2l <code>\typein</code> : Remove unnecessary braces Replace <code>\def</code> by <code>\let</code> . . . . .	80
1995-04-27 ltplain.dtx v1.1i General: Move <code>\hang</code> and <code>\textindent</code> to latex209.def . . . . .	33	1995-05-08 ltfstrc.dtx v2.3n <code>\ifnot@nil</code> : Use <code>\@firstofone</code> . . . . .	471
1995-04-29 ltcntrl.dtx v1.0e General: Moved init of <code>\protect</code> to ltdefs.dtx . . . . .	280	1995-05-11 fontdef.dtx v2.2j General: Updates to some plain macros . . . . .	546
Removed unused defs for <code>\@setprotect</code> and <code>\@resetprotect</code> . . . . .	280	1995-05-12 ltclass.dtx v1.0n <code>\DeclareOption*</code> : Use <code>\toks@</code> to remove need to double hash /1557 . . . . .	833
1995-04-29 ltdefs.dtx v1.2j <code>\protect</code> : Init <code>\protect</code> here . . . . .	90	1995-05-12 ltfloat.dtx v1.1h <code>\@footnotemark</code> : Add <code>\nobreak</code> to allow hyphenation. latex/1605 . . . . .	781
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1995-05-02 ltsect.dtx v1.0l <code>\@dottedtocline</code> : Don't reset to <code>\rmfamily</code> . . . . .	758	1995-05-12 ltvers.dtx v1.0e General: Add autoload docstrip guards Check for format older than 1 year . . . . .	39
1995-05-03 ltsect.dtx v1.0m General: TO: Promoted documentation to doc.sty standard . . . . .	747	1995-05-13 ltfstrc.dtx v2.3o General: Use single hash mark in <code>\DeclareOption</code> . . . . .	459
1995-05-06 ltsect.dtx 1.0n <code>\@seccntformat</code> : Use <code>\quad</code> instead of <code>\hspace</code> . . . . .	753	1995-05-16 ltfloat.dtx v1.1i <code>\@makefnmark</code> : Now use <code>\textsuperscript.</code> . . . . .	778
<code>\@sect</code> : Added <code>\relax</code> after <code>\@seccntformat</code> just in case . . . . .	751	<code>\textsuperscript</code> : Command added./pr1503 . . . . .	778
1995-05-07 ltboxes.dtx v1.0t General: Use <code>\hb@xt@</code> . . . . .	671	<code>\thefootnote</code> : Streamlined parts of code. . . . .	777
1995-05-07 ltdefs.dtx v1.2k <code>\hb@xt@</code> : Macro added . . . . .	79	1995-05-17 ltboxes.dtx v1.0u <code>\@irsbox</code> : Removed surplus braces . . . . .	684
1995-05-07 ltmath.dtx v1.0r General: Use <code>\hb@xt@</code> . . . . .	639	1995-05-17 ltdefs.dtx v1.0o <code>\g@addto@macro</code> : Make long for latex/1522 . . . . .	107
1995-05-07 ltoutput.dtx v1.1m General: Use <code>\hb@xt@.</code> . . . . .	926	1995-05-17 ltlists.dtx v1.0g <code>\@item</code> : Removed surplus braces . . . . .	666
1995-05-07 ltpictur.dtx v1.0g General: Use <code>\hb@xt@</code> . . . . .	711	<code>\@nbitem</code> : Removed surplus braces . . . . .	667
1995-05-07 ltplain.dtx v1.1j General: Use <code>\hb@xt@</code> . . . . .	15	<code>enumerate</code> : Use <code>\thr@@</code> and remove surplus braces . . . . .	668
		<code>itemize</code> : Use <code>\thr@@</code> . . . . .	669
		1995-05-18 ltfloat.dtx v1.1j <code>\@makefnmark</code> : Added <code>\normalfont.</code> . . . . .	778

<code>\thempfootnote</code> : Added <code>\itshape</code> . . . . .	777	<code>\textsuperscript</code> : Use	
1995-05-19 <code>ltpictur.dtx</code> v1.1a		<code>\@textsuperscript</code> . . . . .	778
General: Support autoloading feature	711	1995-05-24 <code>ltfssbas.dtx</code> v3.0a	
1995-05-20 <code>ltcounts.dtx</code> v1.1b		General: (DPC) Make file from	
<code>\@definecounter</code> : Streamlined code	402	previous file, <code>fam.dtx</code> 1995/05/20	
<code>\@fnsymbol</code> : Allowing both text and		v2.2d . . . . .	410
math . . . . .	406	<code>\mathgroup</code> : (DPC) No need to	
<code>\fnsymbol</code> : Streamlined code . . . . .	405	redefine <code>\newfam</code> as not outer . . .	410
1995-05-20 <code>ltcounts.dtx</code> v1.1c		1995-05-24 <code>ltfsscmp.dtx</code> v3.0a	
<code>\@definecounter</code> : And do it right . . .	402	General: (DPC) Make file from	
1995-05-20 <code>ltfloat.dtx</code> v1.1k		previous file, <code>fam.dtx</code> 1995/05/20	
<code>\@makefnmark</code> : Moved <code>\normalfont</code>		v2.2d . . . . .	483
back and use <code>\@textsuperscript</code>	778	1995-05-24 <code>ltfssdcl.dtx</code> v3.0a	
Moved <code>\normalfont</code> to		General: (DPC) Make file from	
<code>\textsuperscript</code> . . . . .	778	previous file, <code>latint.dtx</code> 1995/05/21	
<code>\textsuperscript</code> : Use <code>\normalfont</code> .	778	v2.1t . . . . .	488
1995-05-21 <code>ltfssdcl.dtx</code> v2.1t		1995-05-24 <code>ltfssini.dtx</code> v3.0a	
<code>\DeclareMathRadical</code> : Allow for		General: (DPC) Make file from	
undefined cs names . . . . .	513	previous file, <code>lfont.dtx</code> 1995/05/23	
1995-05-21 <code>ltlists.dtx</code> v1.0f		v2.2e . . . . .	518
General: Moved to <code>doc.sty</code> standard	654	<code>\cal</code> : (DPC) Remove definition . . .	544
1995-05-21 <code>ltmath.dtx</code> v1.0r		<code>\mit</code> : (DPC) Remove definition . . .	544
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General: Remove <code>\mathhexbox</code> from		General: (DPC) Make file from	
this file . . . . .	644	previous file, <code>tracefnt</code> 1995/05/16	
Update some plain macros . . . . .	639	v2.3o . . . . .	458
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<code>\r@t</code> : Use <code>\sqrtsign</code> instead of		General: (DPC) Fix <code>\ProvidesFile</code>	
<code>\sqrt</code> . . . . .	641	usage . . . . .	458
1995-05-21 <code>ltoutenc.dtx</code> v1.7h		1995-05-25 <code>ltclass.dtx</code> v1.0p	
<code>\@inmathwarn</code> : Added several		<code>\endfilecontents</code> : Delete	
<code>\@onlypreamble</code> . . . . .	358	<code>\filecontents</code> after preamble . . .	851
1995-05-21 <code>ltoutenc.dtx</code> v1.7j		1995-05-25 <code>ltfilehook.dtx</code> v1.0t	
General: Updated some plain macros	370	<code>\unqu@tefilef@und</code> : (CAR) added	
1995-05-21 <code>ltplain.dtx</code> v1.1j		<code>\long</code> . . . . .	885
General: Moved some code to other		1995-05-25 <code>ltfiles.dtx</code> v1.0s	
files . . . . .	15	<code>\document</code> : Added check for <code>\topskip</code>	
1995-05-22 <code>ltplain.dtx</code> v1.1k		zero . . . . .	336
General: Definitions of <code>\footins</code> and		1995-05-25 <code>ltfiles.dtx</code> v1.0t	
<code>\footnoterule</code> moved to <code>ltfloat</code> . . .	34	<code>\@iffilenamepath</code> : (CAR) added <code>\long</code>	348
1995-05-22 <code>lttab.dtx</code> v1.1a		<code>\document</code> : Corrected typo . . . . .	336
General: Support autoloading feature	686	<code>\IfFileExists@</code> : (CAR) added <code>\long</code>	347
1995-05-23 <code>ltfssini.dtx</code> v2.2e		<code>\nofiles</code> : (CAR) added <code>\long</code> . . . .	339
<code>\newfont</code> : Font assignment made local		<code>\protected@write</code> : (CAR) added	
again. . . . .	540	<code>\long</code> . . . . .	339
1995-05-24 <code>ltdefns.dtx</code> v1.1l		1995-05-25 <code>ltfloat.dtx</code> v1.1m	
<code>\newif</code> : (DPC) New implementation . .	85	<code>\@savemarbox</code> : (CAR) Resettings	
1995-05-24 <code>ltdefns.dtx</code> v1.2m		moved to hook . . . . .	773
<code>\typein</code> : (DPC) New implementation	80	<code>\@xfloat</code> : (CAR) Resettings moved to	
1995-05-24 <code>ltfloat.dtx</code> v1.1l		hook . . . . .	765
<code>\@textsuperscript</code> : Command		1995-05-25 <code>ltlists.dtx</code> v1.0i	
added. . . . .	778	<code>\endtrivlist</code> : Macros moved from	
General: Moved definition of <code>\footins</code>		<code>ltspace.dtx</code> . . . . .	663
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1995-05-25 ltmath.dtx v1.3c classes		command rather than a	
\@eqnnum: replace		two-argument command. ....	361
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<code>\@tabclassz:</code> (DPC) Extra <code>\hskip</code> keeps <code>tabcolsep</code> in empty columns internal/2122 . . . . . 706	<code>\verb:</code> Put setting of verbatim font after <code>\dospecials</code> so that <code>\dospecials</code> cannot reset the
1996-04-23 ltcounts.dtx v1.1d	
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1996-04-24 ltfiles.dtx v1.1e	
<code>\document:</code> (DPC) Reset <code>\AtBeginDocument</code> eg for latex/1297 . . . . . 335	
1996-05-08 ltfstsrc.dtx v3.0h	
<code>\math@egroup:</code> Use <code>\bgroup</code> instead of <code>\begingroup</code> to match a kernel change made in 1994!! . . . . . 470	
1996-05-09 ltfntcmd.dtx v3.3t	
<code>\check@icr:</code> Default definitions added . . . . . 574	
1996-05-17 fontdef.dtx v2.2o	
General: <code>\@@sqrt</code> removed, at last . . . . . 546, 562	
1996-05-17 ltfiles.dtx v1.1f	
<code>\nofiles:</code> added <code>\write</code> to <code>\protected@write</code> for latex/2146 339	
1996-05-18 ltoutenc.dtx v1.7x	
General: Produce error if encoding not found. pr/2054 . . . . . 397	

category code of characters handled by <code>\@noligs</code> . . . . .	638	<code>\nfss@catcodes</code> : omit <code>\relax</code> as not needed . . . . .	424
1996-06-10 ltboxes.dtx v1.0y <code>\@parboxto</code> : (DPC) Changed <code>\endgraf</code> to <code>\@@par</code> . . . . .	679	1996-07-26 ltssdcl.dtx v3.0e <code>\init@restore@version</code> : Removed <code>\ifrestore@version</code> switch and replaced by <code>\init@restore@version</code> . . . . .	492
1996-06-10 ltsect.dtx v1.0t <code>\@sect</code> : (DPC) Changed <code>\endgraf</code> to <code>\@@par</code> . . . . .	751	1996-07-26 ltfsstrc.dtx v3.0i <code>\init@restore@glb@settings</code> : macro added replacing <code>\if@inmath</code> switch . . . . .	469
<code>\@sect</code> : (DPC) Changed <code>\endgraf</code> to <code>\@@par</code> . . . . .	754	1996-07-26 ltlists.dtx v1.0l <code>\@item</code> : Remove unnecessary <code>\global</code> before <code>\@minipage</code> ... . . . .	665
1996-06-13 ltdirchk.dtx v1.0r General: documentation improvements mainly from internal/2174 . . . . .	1	Remove unnecessary <code>\global</code> before <code>\@nobreak</code> ... . . . .	666
1996-06-14 lttab.dtx v1.1h <code>\@tabclassz</code> : (DPC) Change both <code>\z@skip</code> to 1sp for latex/2160 . . . . .	706	1996-07-26 ltmath.dtx v1.1b General: Removed <code>\global</code> before <code>\@ignoretrue</code> in various places. . .	639
1996-06-22 ltspace.dtx v1.2o General: Documentation of problems added . . . . .	312	1996-07-26 ltmiscen.dtx v1.1e <code>\@ignorefalse</code> : put <code>\global</code> into definition . . . . .	619
1996-07-10 ltfinal.dtx v1.0y <code>\toks</code> : Free up memory from scratch registers /2213 . . . . .	1019	<code>\begin</code> : remove <code>\global</code> before <code>\@ignore</code> ... . . . .	625
1996-07-19 ltoutenc.dtx v1.8a <code>\@strip@args</code> : Use char 0 not @ as carrier for <code>\lowercase</code> /2197 . . .	363	<code>\end</code> : remove <code>\global</code> before <code>\@ignore</code> ... . . . .	628
1996-07-26 ltboxes.dtx v1.0z <code>\if@minipage</code> : put <code>\global</code> into definition . . . . .	680	<code>\ignorespacesafterend</code> : user level macro added . . . . .	619
1996-07-26 ltclass.dtx v1.0u <code>\@classoptionslist</code> : made only preamble . . . . .	823	1996-07-26 ltoutput.dtx v1.1v <code>\@testfp</code> : remove <code>\global</code> before <code>\@test</code> ... . . . .	989
<code>\@unusedoptionlist</code> : made only preamble . . . . .	823	<code>\@xtryfc</code> : remove <code>\global</code> before <code>\@test</code> ... . . . .	962
1996-07-26 ltdefs.dtx v1.2y <code>\@reargdef</code> : third arg picked up by <code>\@yargdef</code> . . . . .	83	<code>\@ztryfc</code> : remove <code>\global</code> before <code>\@test</code> ... . . . .	963
<code>\renew@command</code> : use <code>\noexpand</code> instead of <code>\string</code> . . . . .	84	General: put <code>\global</code> into definition remove <code>\global</code> before <code>\@test</code> ... .	936
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<code>\renew@environment</code> : use <code>\relax</code> in place of empty arg . . . . .	85	1996-07-26 ltplain.dtx v1.1t <code>\sh@ft</code> : replace <code>\dimen@z@</code> by <code>\dimen@</code>	33
1996-07-26 ltfloat.dtx v1.1n <code>\@endfloatbox</code> : remove unnecessary <code>\global</code> before <code>\@minipage</code> ... .	769	1996-07-26 ltsect.dtx v1.0u <code>\@starttoc</code> : removed <code>\global</code> before <code>\@nobreak</code> ... . . . .	756
<code>\@savemarbox</code> : remove unnecessary <code>\global</code> before <code>\@minipage</code> ... .	773	<code>\@xsect</code> : Removed <code>\global</code> before <code>\@nobreak</code> ... . . . .	752
<code>\@setminipage</code> : remove unnecessary <code>\global</code> before <code>\@minipage</code> ... .	767	1996-07-26 ltspace.dtx v1.2p <code>\if@nobreak</code> : put <code>\global</code> inside definition . . . . .	318
<code>\@setnobreak</code> : remove unnecessary <code>\global</code> before <code>\@nobreak</code> ... . .	767	1996-07-27 ltssbas.dtx v3.0q General: <code>\if@inmath</code> switch removed	422
1996-07-26 ltssbas.dtx v3.0p <code>\@DeclareMathSizes</code> : use faster <code>\if</code> test . . . . .	417	1996-07-27 ltspace.dtx v1.2q General: Further documentation of problems . . . . .	312

1996-07-27 ltspace.dtx v1.2r		1996-10-21 lttab.dtx v1.1i	
General: Correct documentation of		<code>\@array</code> : Use <code>\set@typeset@protect</code>	699
problems	312	General: Moved the code associated	
1996-08-02 ltfloat.dtx v1.1o		with <code>\@mkpream</code> into the group	
<code>\@xympar</code> : Remove <code>\global</code> before		provided by the box, for	
<code>\@ignore</code>	774	robustness (latex/2183)	698
1996-08-02 ltsect.dtx v1.0v		<code>\multicolumn</code> : Make <code>\multicolumn</code>	
<code>\@afterheading</code> : Removed <code>\global</code>		long (latex/2180)	701
before <code>\@nobreak</code>	754	<code>\tabbing</code> : Moved the <code>\indent</code> so that	
1996-08-02 ltspace.dtx v1.2s		the <code>\everypar</code> can remove it when	
<code>\@Esphack</code> : Remove <code>\global</code> before		necessary; this is needed because	
<code>\@ignore</code>	321	the code for items in lists has	
1996-08-25 ltfssbas.dtx v3.0r		changed (see pr/22111)	693
<code>\nfss@catcodes</code> : Reset the acute,		1996-10-23 ltlists.dtx v1.0m	
grave and double quote chars as		<code>\@item</code> : <code>\@nobreak</code> moved into the	
well	425	<code>\everypar</code> and not executed	
1996-09-21 ltoutput.dtx v1.1w		unconditionally, see above	666
<code>\@writesetup</code> : Added		<code>\kern</code> changed to <code>\setbox</code>	666
<code>\@parboxrestore</code> and made		Added setting of <code>\clubpenalty</code> and	
consequent deletions: wait for the		set <code>\@nobreakfalse</code> only when	
howls of protest	953	necessary	666
1996-09-25 ltdirchk.dtx v1.0t		1996-10-23 ltsect.dtx v1.0x	
General: Move ltxcheck to separate file	14	<code>\@xsect</code> : Replaced <code>\hskip</code> with	
1996-09-28 ltmiscen.dtx v1.1f		<code>\setbox</code> as used in	
<code>\@xobeysp</code> : Moved to ltspace.dtx	633	<code>\@afterheading</code>	752
1996-09-28 ltspace.dtx v1.2t		1996-10-24 ltboxes.dtx v1.1a	
<code>\@xobeysp</code> : Moved from ltmiscen.dtx		<code>\@arrayparboxrestore</code> : Added local	
and redefined to use		settings of flags: dangerous!	679
<code>\nobreakspace</code>	328	<code>\@iiiminipage</code> : Use it or lose it	
1996-09-29 ltfiles.dtx v1.1g		( <code>@setminpage</code> ): Frank will want to	
<code>\document</code> : Added disabling of		lose it	681
<code>\@nodocument</code>	336	1996-10-24 ltfloat.dtx v1.1p	
1996-09-29 ltoutput.dtx v1.1x		<code>\@floatboxreset</code> : Added local	
<code>\newpage</code> : Checks for noskipsec and		settings of flags: dangerous!	767
inlabel added	940	<code>\@marginparreset</code> : Added local	
1996-09-29 ltsect.dtx 1.0w		settings of flags: dangerous!	773
<code>\@noskipsectrue</code> : Added		<code>\@xfloat</code> : Added <code>\@nodocument</code> to	
documentation	748	trap floats in the preamble	764
1996-09-30 ltoutput.dtx v1.1y		1996-10-24 ltoutput.dtx v1.1z	
<code>\newpage</code> : Checks for noskipsec and		<code>\@addtocurcol</code> : Added <code>\nobreak</code> , etc	
inlabel removed pending further		as appropriate	968, 971
tests	940	<code>\@specialoutput</code> : Added <code>\nobreak</code> as	
1996-10-04 ltclass.dtx v1.0v		appropriate	946
<code>\RequirePackageWithOptions</code> : Reset		<code>\@topnewpage</code> : Added <code>\@nodocument</code>	
<code>\@unprocessedoptions</code> for /2269	839	to trap <code>\twocolumn</code> in the	
1996-10-05 ltfiles.dtx v1.1h		preamble	942
<code>\@clubpenalty</code> : Added setting its		<code>\newpage</code> : Better checks for noskipsec	
value	334	and inlabel added, plus nobreak	940
1996-10-08 ltfntcmd.dtx v3.3u		1996-10-25 ltlists.dtx v1.0n	
<code>\DeclareTextFontCommand</code> : Removed		<code>\endtrivlist</code> : Change <code>\indent</code> to	
<code>\check@icr</code> when in vmode since		<code>\leavevmode</code>	663
it causes various errors (see		Reset flags explicitly	663
pr/2157)	572	1996-10-25 ltoutput.dtx v1.2a	
		<code>\newpage</code> : Reset all flags explicitly	940

- 1996-10-26 ltlists.dtx v1.0o  
`\endtrivlist`: Correct typo . . . . . 663
- 1996-10-27 ltoutenc.dtx v1.8c  
`\@strip@args`: Removed macro . . . 361  
 General: Added `\r A` . . . . . 371  
 Added  
`\textasteriskcentered` . . 367, 378  
 Corrected syntax descriptions . . . 355  
 Removed `\aa` and `\AA` . . 367, 371, 374
- 1996-10-28 ltplain.dtx v1.1u  
 General: (CAR) More doc changes . . 15  
`\dotfill`: Removed math mode . . . . 34
- 1996-10-29 ltplain.dtx v1.1v  
`\dotfill`: Got arithmetic correct  
 (CAR) . . . . . 34
- 1996-10-29 ltspace.dtx v1.2u  
`\@gnewline`: Added macro . . . . . 318  
`\@no@lnbk`: Macro replaces `\@lnbk` and  
`\@no@lnbk` . . . . . 316  
`\:`: Corrected and rationalised code 316  
`\nolinebreak`: Reimplemented both  
 using `\@no@lnbk` . . . . . 315
- 1996-10-31 ltfinal.dtx v1.0z  
 General: Added extra `\lcode`, hoping  
 it does no harm in T1  
 (pr/1969) . . . . . 1009, 1016
- 1996-10-31 ltlists.dtx v1.0p  
`\@trivlist`: Added check for missing  
 item in outer list . . . . . 662
- 1996-10-31 ltsect.dtx v1.0y  
 General: Corrected and tidied  
 documentation; removed long  
 lines . . . . . 747
- 1996-11-03 ltplain.dtx v1.1w  
`\dotfill`: Saved tokens by using  
`\hb@xt@` . . . . . 34
- 1996-11-04 ltterror.dtx v1.2m  
`\@nodocument`: Always define  
`\@nodocument` in kernel, so that it  
 can be cleared by `\document`. . . . 288
- 1996-11-04 ltlists.dtx v1.0q  
`\@trivlist`: Moved check for missing  
 item: only checked when not  
 inlabel flag is false . . . . . 662
- 1996-11-05 ltfiles.dtx v1.1i  
`\nofiles`: Standard `\if@nbreak` test  
 added . . . . . 339
- 1996-11-09 ltmath.dtx v1.1c  
`\@ensuredmath`: Made long, as it was  
 before. /2104 . . . . . 651
- 1996-11-18 ltfsbas.dtx v3.0s  
`\define@newfont`: (DPC) lowercase fd  
 file names. internal/1044 . . . . . 424
- 1996-11-18 ltoutenc.dtx v1.8d  
 General: (DPC) lowercase external file  
 names. internal/1044 . . . . . 397
- 1996-11-20 fontdef.dtx v2.2p  
 General: lowercase fd and enc.def file  
 names /1044 . . . . . 546
- 1996-11-20 ltvers.dtx v1.0f  
 General: Check for old format  
 modified /2319 . . . . . 39
- 1996-11-23 ltoutenc.dtx v1.8e  
 General: Corrected description . . . . 355  
 Extended description . . . . . 356
- 1996-11-28 ltvers.dtx v1.0g  
 General: Check for old format  
 modified /2319 . . . . . 39
- 1996-12-06 ltdirchk.dtx v1.0u  
`\IfFileExists`: \*\*\* removed from  
 various messages for GNU Make.  
 internal/2338 . . . . . 10
- 1996-12-06 ltfloat.dtx v1.1r  
`\@caption`: Call `\@setminpage` if  
 needed. latex/2318 . . . . . 763
- 1996-12-06 ltfsini.dtx v3.0h  
 General: (DPC) Remove \*\*\* from  
 messages internal/2338 . . . . . 544
- 1996-12-17 ltdefs.dtx v1.0w  
`\g@addto@macro`: Use `\begingroup` to  
 save making a mathord . . . . . 107
- 1996-12-20 ltsect.dtx v1.0z  
`\@dottedtocline`: Added `\nobreak` for  
 latex/2343 . . . . . 758
- 1997-01-08 fontdef.dtx v2.2q  
 General: Use `\DeclareMathDelimiter`  
 to set delimiter codes . . . . . 555  
`\mathparagraph`: Define using  
`\DeclareMathSymbol` . . . . . 564
- 1997-01-08 ltfiles.dtx v1.1j  
`\@include`: reset `\deadcycles`  
 latex/2365 . . . . . 343
- 1997-01-08 ltmath.dtx v1.1d  
`\root`: (DPC) Remove spurious space  
 tokens from plain T<sub>E</sub>X definition  
 /2359 . . . . . 641
- 1997-02-05 ltdefs.dtx v1.0x  
`\g@addto@macro`: missing percent  
 /2402 . . . . . 107
- 1997-02-21 ltlists.dtx v1.0r  
`\@item`: `\ifvoid` check added for  
`\noindent`. latex/2414 . . . . . 666
- 1997-03-21 ltcounts.dtx v1.1e  
`\fnsymbol`: Use `\mathsection` and  
`\mathparagraph`. latex/2445 . . . 405



1997-04-14 ltfiles.dtx v1.1k	1997-08-29 ltoutenc.dtx v1.9f
<code>\document</code> : Set the document space	General: Added OT4 encoding,
factor defaults. latex/2404 . . . . . 335	provided by Marcin Woliński. . . 354
<code>\normalsfcodes</code> : Macro added (from	1997-09-09 ltdefns.dtx v1.2z
patch file) latex/2404 . . . . . 339	<code>\providecommand</code> : Use <code>\begingroup</code>
1997-04-14 ltoutput.dtx v1.2b	to avoid generating math ords if
<code>\writsetup</code> : Call <code>\normalsfcodes</code>	used in math mode. pr/2573 . . . . 86
(from patch file) latex/2404 . . . . 955	1997-09-15 ltpictur.dtx v1.1g
Move <code>\label</code> and <code>\index</code> (from	<code>\@getcirc</code> : Warn if lines become
patch file) . . . . . 955	invisible pr/2524 . . . . . 732
1997-04-24 ltbibl.dtx v1.1m	<code>\@picture@warn</code> : Macro added
<code>\@citex</code> : <code>\@empty</code> to avoid primitive	pr/2524 . . . . . 732
error on empty cite keys.	<code>\@sline</code> : Warn if lines become
latex/2432 . . . . . 788	invisible pr/2524 . . . . . 721
1997-04-30 ltoutenc.dtx v1.9a	1997-10-06 ltcounts.dtx v1.1f
General: Changed <code>\textsc</code> to	<code>\@Roman</code> : Change <code>\@Roman</code> to be fully
<code>\scshape</code> . . . . . 368	expandable, so that the result is
Introduced <code>\textcopyright</code> and	written properly to files. . . . . 405
modified <code>\copyright</code> . . . . . 368	<code>\@slowromancap</code> : Macro added. . . . 405
Introduced <code>\textcopyright</code> and	1997-10-08 ltlogos.dtx v1.1h
modify <code>\copyright</code> . . . . . 369	<code>\LaTeX</code> : Simplify macro (force loading
Modified <code>\textunderscore</code> ,	of suitable math fonts once). . . . 331
removing <code>\mathunderscore</code> . . . . 368	1997-10-10 ltclass.dtx v1.0y
Modified <code>\underscore</code> , removing	<code>\endfilecontents</code> : <code>\@currenvir</code> in
<code>\mathunderscore</code> . . . . . 369	banner . . . . . 853
1997-04-30 ltoutenc.dtx v1.9b	<code>\reserved@e</code> not <code>\verbatim@out</code> to
General: Added <code>\leavevmode</code> to	save a csname . . . . . 853
<code>\textunderscore</code> . . . . . 368	Check for text before or after <code>\end</code>
1997-05-04 ltoutenc.dtx v1.9c	environment. latex/2636 . . . . . 854
General: Added ‘hex index tabs’ . . . 375	Use <code>\@gobbletwo</code> . . . . . 853
Added TS1 encoding v2.2.beta . . . 381	1997-10-17 ltfntcmd.dtx v3.3w
1997-05-07 ltoutenc.dtx v1.9d	<code>\check@nocorr@</code> : Check for vertical
General: Added <code>\leavevmode</code> to	mode moved here, from
<code>\textcompwordmark</code> . . . . . 368	<code>\DeclareTextFontCommand</code> (see
1997-05-07 ltspace.dtx v1.2v	PR/2646). . . . . 574
<code>\newline</code> : Made completely robust. 317	<code>\DeclareTextFontCommand</code> :
1997-05-29 ltfsssrc.dtx v3.0j	Reinstalled <code>\check@icr</code> as check is
General: Replaced <code>\@</code> by	now done in <code>\check@nocorr@</code> (see
<code>\MessageBreak</code> , as suggested by	PR/2646). . . . . 572
Donald Arseneau. . . . . 460	1997-10-20 ltfinal.dtx v1.1a
1997-05-29 ltlogos.dtx v1.1f	<code>\@uclclist</code> : Removed <code>\aa</code> and <code>\AA</code>
<code>\LaTeXe</code> : Added <code>\m@th</code> so that the	from <code>\@uclclist</code> as these are
$\mathbb{X}$ logo works with non-zero	macros. . . . . 1016
values of <code>\mathsurround</code> . . . . . 331	1997-10-21 ltdefns.dtx v1.2z1
1997-06-16 ltdirchk.dtx v1.0v	<code>\renewcommand</code> : Use
General: documentation improvements	<code>\begingroup</code> / <code>\endgroup</code> rather
mainly from internal/2520 . . . . . 1	than braces for grouping, to avoid
1997-06-16 ltfloat.dtx v1.1s	generating empty math atom. . . . 84
General: documentation fixes . . . . 760	1997-10-21 ltfssbas.dtx v3.0t
1997-06-16 ltfntcmd.dtx v3.3v	<code>\define@newfont</code> : Move
General: Fix typo in documentation. 570	<code>\makeatletter</code> to
1997-08-05 ltoutenc.dtx v1.9e	<code>\nfss@catcodes</code> . . . . . 424
General: Corrected order of arguments	
in <code>\UseTextSymbol</code> example. . . . 355	

<code>\nfss@catcodes</code> : Moved	Removed default settings, see next section. . . . .	381
<code>\makeatletter</code> from		
<code>\try@load@font@shape</code> . . . . .	1997-12-19 ltoutenc.dtx v1.9i	
1997-11-09 ltoutput.dtx v1.2c	General: Documentation corrections.	354
<code>\@specialoutput</code> : Remove incorrect code: only one <code>\@emptycol</code> is needed here . . . . .	1997-12-20 fontdef.dtx v2.2s	
	General: Added documentation . . .	548
<code>\@topnewpage</code> : Documentation of <code>vsize</code> check enhanced . . . . .	1997-12-31 ltoutenc.dtx v1.9k	
	General: Further correction . . . . .	355
1997-11-13 ltfssdcl.dtx v3.0f	1998-01-12 ltoutenc.dtx v1.9k	
<code>\DeclareSymbolFont</code> : (DPC) Really update <code>\group@list</code> don't leave new version in <code>\toks@</code> . latex/2661	General: Added <code>\ProvidesPackage</code> for textcomp.sty . . . . .	354
	Adding missing braces and <code>\ushape</code> . . . . .	383
<code>\stepcounter</code> : (DPC) Remove as never used. (Re)defined in ltcounts . . . . .	1998-01-16 ltoutenc.dtx v1.9m	
	General: fixed decimal codes. latex/2734 . . . . .	379
1997-11-19 ltfloat.dtx v1.1t	1998-03-04 ltdefns.dtx v1.2z2	
<code>\@footnotetext</code> : Missing percent, again . . . . .	<code>\@xargdef</code> : Unnecessary <code>\expandafter</code> removed: pr/2758 .	82
1997-11-19 ltoutput.dtx v1.2d	1998-03-05 ltoutenc.dtx v1.9n	
<code>\@vtryfc</code> : Reindent code, to be understandable(DPC). . . . .	General: Added masc/fem ords as in pr/2579 . . . . .	368
1997-11-20 ltfssdcl.dtx v3.0g	1998-03-20 ltdefns.dtx v1.2z3	
<code>\document@select@group</code> : (DPC) inline use of <code>\stepcounter</code> (faster, and saves a <code>cname</code> per math version as no reset list) . . . . .	<code>\@thirdofthree</code> : Macro added . . . . .	87
	1998-03-20 ltoutenc.dtx v1.9o	
<code>\select@group</code> : (DPC) inline use of <code>\stepcounter</code> (faster, and saves a <code>cname</code> per math version as no reset list) . . . . .	General: Documentation added about order of decls . . . . .	357
	Documentation added for pr/2783	356
1997-11-23 ltoutenc.dtx v1.9g	<code>\UndeclareTextCommand</code> : Macro added for pr/2783 . . . . .	365
General: Use <code>\textperthousand</code> , <code>\textpertenthousand</code> and <code>\textfractionsolidus</code> not <code>\textpermill</code> , <code>\textpertenmill</code> and <code>\textfraction</code> . /2673 . . . .	1998-03-20 lttextcomp.dtx v1.9o	
	General: Added various <code>\UndeclareTextCommand</code> declarations for pr/2783 . . . . .	608
1997-12-17 ltoutenc.dtx v1.9h	Load decls after defaults for speed.	608
General: Added <code>\textperthousand</code> and <code>\textpertenthousand</code> .	1998-03-21 ltclass.dtx v1.0z	
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\markright: Reimplementation to fix expansion error (pr/3203). . . . .	\@providesfile: Explicitly set catcode of \endlinechar to 10 (pr/3334) . . . . .
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2000-07-12 ltoutput.dtx 1.2g	2001-06-04 fontdef.dtx v2.2z
General: Ensure that rule is in \normalcolor . . . . .	General: Guard against math active equal and pipe sign in \models (pr/3333) . . . . .
2000-07-12 ltoutput.dtx 1.2i	Guard against math active equal sign in \Relbar (pr/3333) . . . .
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2000-08-23 ltfinal.dtx v1.1c	General: But only if it is a char (pr/3334) . . . . .
General: Fix typo in warning . . . .	2001-06-04 ltpictur.dtx v1.1j
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\@use@text@encoding: Rearranged but no change to final code, CAR (pr/3160) . . . . .	2001-06-04 ltvers.dtx v1.0i
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2000-09-01 ltfinal.dtx v1.1d	2001-06-05 ltoutenc.dtx v1.94
\@errhelp: Set error help empty at very end (pr/449 done correctly). . .	General: Text composite Commands need kludges for ‘,’ – see tlb1903.lvt . . . . .
2000-09-24 ltfloat.dtx v1.2b	2001-08-26 ltclass.dtx v1.1f
\end@dblfloat: FMI: use output routine to defer float . . . . .	\@providesfile: Readded setting of space char (pr/3353) . . . . .
2000-09-24 ltoutput.dtx v1.2b	2002-02-24 ltplain.dtx v1.1x
\@docclearpage: FMI: ensure \docclearpage is called again until all floats are output. . . . .	\loggingall: Macro added . . . . .
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2001-01-07 ltoutput.dtx v1.2j	\tracingall: Use newly added \loggingoutput . . . . .
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2002-06-17 ltoutenc.dtx v1.95	2004-01-03 ltoutenc.dtx v1.99b
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2015-09-24 ltluatex.dtx v1.0a		allocation in <code>luatex</code> (0.85) . . . . .	18
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2015-12-10 ltfinal.dtx v2.0i		<code>\@ovhorz</code> : use glue not leaders if horizontal line not required . . . . .	736
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2015-12-18 ltluatex.dtx v1.0l		<code>\if@ovhline</code> : macro added (latex/4452) . . . . .	733
General: Load Unicode data from source . . . . .	51	<code>\if@ovvline</code> : macro added (latex/4452) . . . . .	733
2016-01-04 ltfinal.dtx v2.0j		2016-04-22 ltfinal.dtx v2.0q	
General: Do not set up inter character classes for XeTeX . . . . .	1007	<code>\e@alloc@intercharclass@top</code> : XeTeX 0.99996 has 4096 char classes not 256 . . . . .	1004
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2016-01-05 ltfinal.dtx v2.0k		General: OT1 definition (was duplicate T1 definition) . . . . .	372
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2016-01-05 ltfinal.dtx v2.0l		General: don't declare as <code>\@onlypreamble</code> . . . . .	828
General: Correct <code>latexrelease</code> guards . . . . .	1007	2016-07-29 ltplain.dtx v2.2c	
Ensure old definitions for inter-character class toks are available using <code>latexrelease</code> . . . . .	1007	<code>\extrafloats</code> : use <code>\global \chardef</code> . . . . .	21
Missing brace . . . . .	1007	<code>\newinsert</code> : fix for <code>tlb-newinsert-001</code> . . . . .	23
2016-01-05 ltfinal.dtx v2.0m		2016-10-02 ltclass.dtx v1.2a	
General: Undefine XeTeX classes when using patching an older kernel . . . . .	1007	<code>\@ifclasswith</code> : Ignore spaces while checking for option clash . . . . .	829
2016-01-05 ltfinal.dtx v2.0p		<code>\ExecuteOptions</code> : Ignore spaces in argument . . . . .	837
General: Only apply XeTeX change if XeTeX is in use . . . . .	1007	2016-10-15 ltdirchk.dtx v1.2b	
2016-02-11 ltluatex.dtx v1.0m		General: Require eTeX . . . . .	4
General: <code>pdf_stream_filter_callback</code> removed . . . . .	63	2016-10-15 lterror.dtx v1.2p	
<code>process_rule</code> , <code>[hv]pack_quality</code> <code>append_to_vlist_filter</code> added . . . . .	62	General: Require eTeX . . . . .	281
<code>read_cidmap_file</code> added . . . . .	62	2016-10-15 ltfinal.dtx v2.0r	
<code>show_warning_message</code> added . . . . .	63	General: Require eTeX . . . . .	1003
<code>token_filter</code> removed . . . . .	62	2016-10-15 ltfinal.dtx v2.0s	
		General: Tidy up status of char 127 . . . . .	1003
		2016-10-15 ltffssini.dtx v3.1b	
		General: Require eTeX . . . . .	518
		2016-10-15 ltplain.dtx v2.2d	
		General: Require eTeX . . . . .	15

2016-10-16 ltplain.dtx v2.3a	2017-02-19 ltoutenc.dtx v2.0f
<code>\newlanguage</code> : Allow languages up to 16383 in luatex . . . . .	General: add <code>\@empty</code> to guard against 3rd argument being empty . . . .
2016-10-19 ltcounts.dtx v1.1j	declare composites with empty base for hat and tilde, use same slots for <code>\textasciicircum</code> ans <code>\textasciitilde</code> . . . . .
<code>\TextOrMath</code> : Test directly for <code>\protected</code> . . . . .	declare straight quotes using new <code>\remove@tlig</code> command . . . . .
2016-11-06 ltplain.dtx v2.3b	2017-02-22 ltoutenc.dtx v2.0g
General: Drop <code>\outer</code> entirely . . . .	General: Fix typo introduced at 2.0f . . . .
2016-11-09 ltclass.dtx v2.1b	2017-02-24 ltoutenc.dtx v2.0h
<code>\@fileswithoptions</code> : Improve <code>\ifx</code> tests PR/4497 . . . . .	General: introduce <code>\DeclareUnicodeAccent</code> . . . . .
2016-11-17 ltluatex.dtx v1.0p	<code>\DeclareTextCompositeCommand</code> : add check whether the accent command is defined for this encoding . . . .
2016-12-03 fontdef.dtx v3.0a	2017-03-08 ltclass.dtx v1.2c
General: (DPC) Default to TU encoding for Unicode TeX engines . . . .	General: add <code>\@parse@version@dash</code> to support yyyy-mm-dd as well as yyyy/mm/dd . . . . .
<code>\shapedefault</code> : (DPC) Default to TU encoding for Unicode TeX engines . . . .	2017-03-09 ltfinal.dtx v2.0t
2016-12-04 ltoutenc.dtx v2.0a	<code>\l@nohyphenation</code> : ensure <code>\l@nohyphenation</code> is defined. . . .
General: Added TU encoding . . . . .	2017-03-09 ltmiscen.dtx v1.1m
2017-01-01 ltoutput.dtx v1.3b	<code>\@verbatim</code> : Use <code>\language</code> not <code>\hyphenchar</code> . . . . .
General: make <code>fpmin</code> negative so ignored even if float height is negative . . . . .	<code>\verb</code> : Use <code>\language</code> to stop hyphenation . . . . .
2017-01-10 ltfsbas.dtx v3.2a	2017-03-10 ltfiles.dtx v1.1n
<code>\showhyphens</code> : Add version of <code>\showhyphens</code> that works with XeTeX. . . . .	<code>\document</code> : Save language default . . . .
2017-01-23 ltoutenc.dtx v2.0b	2017-03-10 ltoutput.dtx v1.3c
General: Added TU specific commands in ASCII range pr/4500 . . . . .	<code>\@writsetup</code> : Reset <code>\language</code> . . . .
2017-01-24 ltoutenc.dtx v2.0c	2017-03-13 ltdefs.dtx v1.5a
General: Declare TU composites for i and j . . . . .	<code>\-</code> : Define <code>\-</code> in terms of <code>\hyphenchar</code> . . . .
Make <code>\textasteriskcentered</code> U+2217 not U+204E . . . . .	2017-03-27 ltdefs.dtx v1.5b
TeX ligature syntax for xetex and luatex reversed . . . . .	<code>\@dischyph</code> : Define <code>\@dischyph</code> after <code>\-</code> . . . . .
2017-01-24 ltoutenc.dtx v2.0d	2017-03-28 ltluatex.dtx v1.1e
General: Declare macron composites for YyGg . . . . .	General: <code>glyph_stream_provider</code> added . . . . .
2017-02-12 ltoutenc.dtx v2.0e	2017-03-29 ltboxes.dtx v1.3a
General: Declare fallback code for <code>\textasteriskcentered</code> . . . . .	<code>\@arrayparboxrestore</code> : Reset <code>\lineskiplimit</code> . . . . .
2017-02-18 ltluatex.dtx v1.1c	2017-04-05 ltoutenc.dtx v2.0i
<code>new_attribute</code> : Parameterize count used in tracking . . . . .	<code>\DeclareTextCompositeCommand</code> : Declare accent command if not already declared when declaring a composite. . . . .
<code>new_bytecode</code> : Parameterize count used in tracking . . . . .	2017-04-10 ltplain.dtx v2.3c
<code>new_chunkname</code> : Parameterize count used in tracking . . . . .	<code>\newlanguage</code> : Correction to code to skip write18 in luatex . . . . .
<code>new_whatst</code> : Parameterize count used in tracking . . . . .	

2017-04-11 ltoutput.dtx v2.4a	2018-05-08 ltclass.dtx v1.2i
\newpage: account for the depth of the last row of the page . . . . . 940	\pkgcls@parse@date@arg: Make suspicious rollback a warning not error: github issue 43 . . . . . 863
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\@addtonextcol: fix doc guards . . . 973	General: Make invalid UTF-8 also safe, for legacy filesystem encodings . 1013
2018-01-06 ltdefs.dtx 1.5c	2018-05-29 ltclass.dtx v1.2j
\@ifundefined: Avoid defining undefined commands to \relax . 101	\endfilecontents: use \curname not \@undefined . . . . . 854
2018-02-18 ltclass.dtx v1.2d	2018-08-11 ltoutenc.dtx v2.0j
\@ifl@ter: Added 0 up front to make bad data come out as 0. . . . . 828	General: Provide \guillemetleft and \guillemetright . . . . 374, 380, 389
General: Introduce rollback concept 859	2018-08-18 ltluatex.dtx v1.1h
2018-03-08 ltcounts.dtx v1.1k	General: append_ to_ vlist_ filter is exclusive . . . . . 62
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\pkgcls@use@this@release: Use full file name for old release . . . . . 865	2018-09-24 fontdef.dtx v3.0b
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 M=lt pictur.dtx, N=ltthm.dtx, O=ltsect.dtx, P=ltfloat.dtx, Q=ltidglo.dtx, R=ltbibl.dtx,  
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 X=ltshipout.dtx, Y=ltoutput.dtx, Z=lthyphen.dtx, aa=ltfinal.dtx



- \bigcap ..... B345
- \bigcirc ..... B392
- \bigcup ..... B346
- \Bigg ..... B630, B639, I50, I51, I52
- \bigg ..... B628, B638, I47, I48, I49
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- \Bigr ..... I46
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- \binoppenalty ..... b323
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- bool commands:
  - \bool\_gset\_false:N ..... h15, S226, X15, X81, X90
  - \bool\_gset\_true:N ..... h10, S221, X10, X120, X342
  - \bool\_if:NTF ..... 178, g96, g107, g119, g123, g132, g134, g144, g153, g154, g157, g162, g164, g250, g394, g403, g405, g460, g474, g487, g537, g570, g614, g624, g657, g665, g670, g671, g679, g701, g714, g782, g828, g829, g883, g896, g913, g933, g1713, g1947, g2225, g2236, h21, h1042, h1051, i159, i163, i175, i297, S232, V168, X21, X88, X363
  - \bool\_lazy\_and:nnTF ..... g653, h132, h1044, h1267, X66, X112, X374
  - \bool\_lazy\_and\_p:nn ..... h1270
  - \bool\_lazy\_any:ntf ..... g414
  - \bool\_lazy\_or:nnTF ..... g69, h542
  - \bool\_new:N ..... g16, g18, g20, g31, g32, g34, g36, g39, g42, g43, g44, h6, h24, S217, V23, X6, X186, X201
  - \bool\_set\_false:N ..... g53, g79, g188, g231, g381, g382, g383, g384, g385, g406, g468, g505, g519, g541, g542, g543, g558, g620, g663, g674, g675, g691, g692, g694, g698, g705, g833, g834, g1603, g2033, h1034, V48
  - \bool\_set\_true:N ..... g58, g189, g220, g380, g404, g480, g493, g494, g666, g667, g721, g722, g728, g729, g735, g736, g850, g868, g1608, g2039, h1031, V46
  - \bool\_while\_do:nn ..... h838
  - \c\_false\_bool ... 178, 264, g1948, g2197, g2495, g2600, i140, i150, i288
  - \c\_true\_bool ..... 178, 264, g1949, g2199, g2496, g2598, i145
- bool internal commands:
  - \g\_mark\_debug\_bool ..... S217, S221, S226, S232
  - \BooleanFalse ..... g1596, g1941, g2495
  - \BooleanTrue ..... g1595, g1940, g2495
  - \bordermatrix ..... I172
  - \bot ..... B321
  - \botfigrule ..... Y744, Y2361
  - \botmark ..... 791, T79, Y649, Y708
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  - \box\_if\_horizontal:Ntf ... X232, X284
  - \box\_if\_vertical:Ntf ..... S60, S284, S315, X206, X257
  - \box\_move\_up:nn ..... X246, X300
  - \box\_new:N ..... n42, S43, X23, X25, X185, X202
  - \box\_set\_dp:Nn ..... X219, X228, X245, X270, X281, X299, X330
  - \box\_set\_eq:NN ... X148, X177, X182
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  - \box\_set\_wd:Nn X217, X243, X268, X297
  - \box\_use:N ..... X125, X223, X248, X276, X301, X331
  - \box\_use\_drop:N ..... n44
  - \box\_wd:N ..... X193, X294, X302

**File Key:** a=ltldirchk.dtx, b=ltplain.dtx, c=ltvers.dtx, d=ltluatex.dtx, e=ltexpl.dtx, f=ltdefns.dtx, g=ltcmd.dtx, h=lthooks.dtx, i=ltcmdhooks.dtx, j=ltalloc.dtx, k=ltcntrl.dtx, l=lterror.dtx, m=ltpar.dtx, n=ltpara.dtx, o=ltmeta.dtx, p=ltspaced.dtx, q=ltlogos.dtx, r=ltfiles.dtx, s=ltoutenc.dtx, t=ltcounts.dtx, u=ltlength.dtx, v=ltfssbas.dtx, w=ltfssaxes.dtx, x=ltfssstrc.dtx, y=ltfsscmp.dtx, z=ltfssdcl.dtx, A=ltfssini.dtx, B=fontdef.dtx, C=preload.dtx, D=ltfntcmd.dtx, E=lttextcomp.dtx, F=ltpageno.dtx, G=ltxref.dtx, H=ltmiscen.dtx, I=ltmath.dtx, J=ltlists.dtx, K=ltboxes.dtx, L=lttab.dtx, M=ltpictur.dtx, N=ltthm.dtx, O=ltsect.dtx, P=ltfloat.dtx, Q=ltidglo.dtx, R=ltbibl.dtx, S=ltmarks.dtx, T=ltpage.dtx, U=ltclass.dtx, V=ltkeys.dtx, W=ltfilehook.dtx, X=ltshipout.dtx, Y=ltoutput.dtx, Z=lthyphen.dtx, aa=ltfinal.dtx

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           Y488, Y508, Y548, Y717, Y726, Y766  
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`\braced` .. B553, B557, B558, B560, B562  
`\bracelu` ..... B555, B559, B561  
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`\braceru` ..... B556, B558, B562  
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`\brack` ..... I58  
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           s635, s648, s674, s701, s704, s705,  
           s706, s707, s708, s709, s710, s711,  
           s712, s762, s1250, s1264, s1290,  
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`\capitalbreve` .....  
   . s846, E162, E163, E194, E691, E950  
`\capitalcaron` .....  
   . s845, E164, E165, E195, E692, E949  
`\capitalcedilla` .....  
   . s832, E166, E167, E196, E693, E940  
`\capitalcircumflex` .....  
   . s840, E168, E169, E197, E694, E944  
`\capitaldieresis` .....  
   . s842, E170, E171, E198, E695, E946  
`\capitaldotaccent` .....  
   . s848, E172, E173, E199, E696, E952

`\capitalgrave` .....  
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`\capitalhungarumlaut` .....  
   . s843, E176, E177, E201, E698, E947  
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   . s847, E178, E179, E202, E699, E951  
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`\capitalogonek` .....  
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   `\char_generate:nn` . e142, g1425, g1721  
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   `\char_set_catcode_active:n` ... g2096  
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 w=ltfssaxes.dtx, x=ltfssstrc.dtx, y=ltfsscmp.dtx, z=ltfssdcl.dtx, A=ltfssini.dtx,  
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 X=ltshipout.dtx, Y=ltoutput.dtx, Z=ltthyphen.dtx, aa=ltfinal.dtx



<code>\char_set_catcode_other:n</code> . . . .	<a href="#">g1714</a>	<code>\clist_gclear:N</code> . . . . .	<a href="#">h837</a>
<code>\char_set_catcode_parameter:N</code> . .	<a href="#">i341</a>	<code>\clist_gput_left:Nn</code> . . . . .	<a href="#">h783</a>
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<code>\char_value_catcode:n</code> . . . . .	<a href="#">i292</a>	<code>\clist_map_inline:Nn</code> <a href="#">V78</a> , <a href="#">V100</a> , <a href="#">V156</a>	
<code>\chardef</code> . . . . .	<a href="#">1031</a> , <a href="#">1038</a> , <a href="#">1073</a> , <a href="#">aa42</a> , <a href="#">aa44</a> , <a href="#">aa48</a> , <a href="#">aa67</a> , <a href="#">aa171</a> , <a href="#">aa172</a> , <a href="#">aa173</a> , <a href="#">aa174</a> , <a href="#">aa175</a> , <a href="#">aa176</a> , <a href="#">aa177</a> , <a href="#">a67</a> , <a href="#">a73</a> , <a href="#">a74</a> , <a href="#">b10</a> , <a href="#">b16</a> , <a href="#">b17</a> , <a href="#">b18</a> , <a href="#">b19</a> , <a href="#">b20</a> , <a href="#">b58</a> , <a href="#">b64</a> , <a href="#">b66</a> , <a href="#">b73</a> , <a href="#">b79</a> , <a href="#">b82</a> , <a href="#">b84</a> , <a href="#">b94</a> , <a href="#">b96</a> , <a href="#">b97</a> , <a href="#">b98</a> , <a href="#">b99</a> , <a href="#">b108</a> , <a href="#">b114</a> , <a href="#">b115</a> , <a href="#">b128</a> , <a href="#">b130</a> , <a href="#">b194</a> , <a href="#">b253</a> , <a href="#">b257</a> , <a href="#">b259</a> , <a href="#">b283</a> , <a href="#">b298</a> , <a href="#">b496</a> , <a href="#">b497</a> , <a href="#">b498</a> , <a href="#">d22</a> , <a href="#">d26</a> , <a href="#">d38</a> , <a href="#">d47</a> , <a href="#">d48</a> , <a href="#">d89</a> , <a href="#">d157</a> , <a href="#">d224</a> , <a href="#">j2</a> , <a href="#">r52</a> , <a href="#">r121</a> , <a href="#">s18</a> , <a href="#">v14</a> , <a href="#">L4</a> , <a href="#">L9</a> , <a href="#">U1141</a> , <a href="#">U1272</a> , <a href="#">U1389</a>	<code>\clist_map_inline:nn</code> <a href="#">h573</a> , <a href="#">h582</a> , <a href="#">V187</a>	
<code>\charsubdef</code> . . . . .	<a href="#">aa353</a>	<code>\clist_new:N</code> . . . . .	<a href="#">h86</a> , <a href="#">V22</a>
<code>\charzero</code> . . . . .	<a href="#">d224</a>	<code>\clist_put_right:Nn</code> . . . . .	
<code>\check</code> . . . . .	<a href="#">B522</a>	... <a href="#">V21</a> , <a href="#">V74</a> , <a href="#">V90</a> , <a href="#">V95</a> , <a href="#">V111</a> , <a href="#">V121</a>	
<code>\CheckCommand</code> . . . . .	<a href="#">1042</a> , <a href="#">f187</a>	<code>\clist_remove_all:Nn</code> . . . . .	<a href="#">V112</a>
<code>\CheckEncodingSubset</code> .	<a href="#">579</a> , <a href="#">E16</a> , <a href="#">E61</a> , <a href="#">E109</a> , <a href="#">E110</a> , <a href="#">E111</a> , <a href="#">E156</a> , <a href="#">E158</a> , <a href="#">E352</a> , <a href="#">E621</a> , <a href="#">E832</a> , <a href="#">E882</a> , <a href="#">E938</a> , <a href="#">E939</a> , <a href="#">E1007</a> , <a href="#">E1124</a> , <a href="#">E1127</a> , <a href="#">E1141</a>	<code>\clist_use:Nn</code> . . . . .	<a href="#">h1063</a>
<code>\chi</code> . . . . .	<a href="#">B288</a>	<code>\clubpenalty</code> . . . . .	<a href="#">303</a> , <a href="#">334</a> , <a href="#">1061</a> , <a href="#">1071</a> , <a href="#">b325</a> , <a href="#">r8</a> , <a href="#">r25</a> , <a href="#">r94</a> , <a href="#">r151</a> , <a href="#">v664</a> , <a href="#">J128</a> , <a href="#">J194</a> , <a href="#">J196</a> , <a href="#">O100</a> , <a href="#">O106</a> , <a href="#">O130</a> , <a href="#">O135</a>
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<code>\citation</code> . . . . .	<a href="#">R11</a> , <a href="#">R39</a> , <a href="#">R67</a> , <a href="#">R84</a>	<code>__cmd_add_arg_spec:n</code> . . . . .	
<code>\cite</code> . . . . .	<a href="#">786</a>	... <a href="#">g503</a> , <a href="#">g517</a> , <a href="#">g577</a> , <a href="#">g651</a> , <a href="#">g651</a> , <a href="#">g686</a>	
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<code>class/.../before</code> . . . . .	<a href="#">876</a>	... <a href="#">129</a> , <a href="#">g743</a> , <a href="#">g781</a> , <a href="#">g798</a> , <a href="#">g844</a> , <a href="#">g847</a> , <a href="#">g854</a> , <a href="#">g864</a> , <a href="#">g931</a> , <a href="#">g940</a>	
<code>class/after</code> . . . . .	<a href="#">876</a>	<code>__cmd_add_default:n</code> . .	<a href="#">129</a> , <a href="#">g750</a> , <a href="#">g790</a> , <a href="#">g806</a> , <a href="#">g844</a> , <a href="#">g844</a> , <a href="#">g861</a> , <a href="#">g875</a>
<code>class/before</code> . . . . .	<a href="#">876</a>	<code>__cmd_add_default_E:nn</code> . . . . .	
<code>\ClassError</code> . . . . .	<a href="#">184</a>	... <a href="#">g758</a> , <a href="#">g844</a> , <a href="#">g859</a> , <a href="#">g909</a>	
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<code>\ClassNoteNoLine</code> . . . . .	<a href="#">1136</a>	<code>__cmd_add_expandable_type_+ :w</code> <a href="#">g866</a>	
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<code>\ClassWarningNoLine</code> . . . . .	<a href="#">184</a>	... <a href="#">g871</a> , <a href="#">g871</a> , <a href="#">g871</a>	
<code>\cleaders</code> . . . . .	<a href="#">b516</a> , <a href="#">B548</a> , <a href="#">B551</a>	<code>__cmd_add_expandable_type_D_-</code>	
<code>\cleardoublepage</code> . . . . .	<a href="#">Y138</a>	aux:NN . . . . .	<a href="#">g871</a> , <a href="#">g877</a> , <a href="#">g894</a>
<code>\ClearHookNext</code> . . . . .	<a href="#">185</a> , <a href="#">h1466</a>	<code>__cmd_add_expandable_type_D_-</code>	
<code>\ClearHookRule</code> . . . . .	<a href="#">189</a> , <a href="#">h1503</a> , <a href="#">h1606</a>	aux:NNN . . . . .	<a href="#">g871</a> , <a href="#">g878</a> , <a href="#">g881</a>
<code>\clearpage</code> <a href="#">202</a> , <a href="#">342</a> , <a href="#">877</a> , <a href="#">878</a> , <a href="#">918</a> , <a href="#">919</a> , <a href="#">r296</a> , <a href="#">r323</a> , <a href="#">r327</a> , <a href="#">r358</a> , <a href="#">r381</a> , <a href="#">r384</a> , <a href="#">r405</a> , <a href="#">r423</a> , <a href="#">H17</a> , <a href="#">H72</a> , <a href="#">H165</a> , <a href="#">Y125</a> , <a href="#">Y138</a> , <a href="#">Y143</a> , <a href="#">Y200</a> , <a href="#">Y407</a> , <a href="#">Y410</a> , <a href="#">Y414</a> , <a href="#">Y455</a> , <a href="#">Y461</a> , <a href="#">Y2207</a> , <a href="#">Y2224</a>		<code>__cmd_add_expandable_type_D_-</code>	
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- \colon ..... B503
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s1510		

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<code>\CYRIE</code>	s1517	<code>\CYRP</code>	s1523
<code>\cyrie</code>	s1517	<code>\cyrp</code>	s1523
<code>\CYRII</code>	s1517	<code>\CYRPHK</code>	s1524
<code>\cyrii</code>	s1517	<code>\cyrphk</code>	s1524
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<code>\cyrishrt</code>	s1517	<code>\cyrq</code>	s1524
<code>\CYRISHRTDSC</code>	s1518	<code>\CYRR</code>	s1524
<code>\cyrishrtdsc</code>	s1518	<code>\cyr</code>	s1524
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<code>\cyrkdsc</code>	s1519	<code>\cyrs</code>	s1525
<code>\CYRKHCERS</code>	s1519	<code>\CYRSACRS</code>	s1525
<code>\cyrkhcrs</code>	s1519	<code>\cyrsacrs</code>	s1525
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\CYRYA	s1530	\DebugHooksOff	191, h1496, h1602
\cyrya	s1530	\DebugHooksOn	191, h1496, h1601
\CYRYAT	s1530	\DebugMarksOff	795, S234
\cyryat	s1530	\DebugMarksOn	795, S234
\CYRYHCRS	s1530	\DebugShipoutsOff	903, X412, X444
\cyryhcrs	s1530	\DebugShipoutsOn	903, X412, X443
\CYRYI	s1530	\DeclareAccent	1030
\cyryi	s1530	\DeclareCommandCopy	94, 1080, f460, f461, f463
\CYRYO	s1531	\DeclareCurrentRelease	E812, E815, U1642
\cyryo	s1530	\DeclareDefaultHookRule	189, h1500, h1605
\CYRYU	s1531	\DeclareDocumentCommand	g2497
\cyryu	s1531	\DeclareDocumentEnvironment	g2533
\CYRZ	s1531	\DeclareEmphSequence	536
\cyrz	s1531	\DeclareEmphSequence	537, A541, A577, A578, A590
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\cyrzhdsc	s1532		
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\dag	1046, s312		
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\dashbox	M309, M808, M825		
\dashv	B403		
\date	747		
\date	O9, O25		
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\dblfloatpagefraction	P287, P301, Y2338		
\dblfloatsep	Y755, Y767, Y1642, Y1768, Y2345		
\dbltextfloatsep	Y222, Y230, Y771, Y1641, Y1767, Y2345		
\dbltopfraction	P284, P298, Y2337		
\ddag	1046, s313		
\ddagger	s313, t166, t172, t179, t181, B374		
\ddot	B518		
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- \@currdir .....  
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- \@current@cmd ..... 1050, s25, v271
- \@currentcounter .....  
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- \@currentlabel 649, G58, G67, G84,  
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- \@currenvir ..... 289, 300, 1063,  
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- \@currenvline ..... I249,  
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- \@currentx ..... 845, U30, U42,  
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- \@currentextension ..... 1026
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- \@currname .....  
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- \@dir .... a163, a166, a168, a170, a171
- \@disable@packageload@do U842, W478
- \@dischyp .....  
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- \@docclearpage ..... Y296, Y371
- \@documentclass ..... 1028
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- \@doendpe H214, H221, H273, H288, J123
- \@dofilelist 1050, r716, r736, H38, H81
- \@donoparitem ..... J144, J158
- \@dot ..... M605, M643
- \@dotsep ..... O215, O238
- \@dottedtocline .. O200, O226, O227
- \@downline ..... M297, M301, M306
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- \@eha ..... c192, f280, f319, f347,  
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z240, z270, z302, z416, z437, z469,  
z510, z555, z560, z615, z733, z737,  
z741, z776, z780, z784, z841, z851,  
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- \@ehb ..... l219,  
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- \@ehc .. c181, f128, f155, f469, l219,  
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- Y807, Y827, Y846, Y859, Y866,  
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- \@empty ..... 72, 89, 411,  
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- \@emptycol ..... 1037,  
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- \@end@check@IncludeInRelease ...  
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- \@end@tempboxa .....  
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- \@enddocument@kernel@warnings ...  
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- \@enddocumenthook . H70, U1027, U1049
- \@endfloatbox P190, P211, P236, P248
- \@endparenv ..... 664, J120, J123
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- \@endpreamblehook ..... 336
- \@endtheorem .... N13, N19, N25, N35
- \@enlargepage .. Y1863, Y1868, Y1870
- \@ensuredmath ..... I420, I422
- \@enumctr ..... J234, J237, J238
- \@enumdepth 667, J226, J232, J233, J234
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- \@eqnswfalse ..... I374
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- \@er@ext ..... 1027
- \@err@ 137, l41, l44, l52, l64, l68, l71, l79
- \@esphack ..... 1024, p38,  
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- \@evenfoot .... T12, T15, Y615, Y674
- \@evenhead .... T12, T15, Y614, Y673
- \@execute@begin@hook .....  
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- \@expast ..... L239, L267

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\expl@@@filehook@file@pop@@ ...
      U860, W157, W522, W532
\expl@@@filehook@file@pop@assign@@nnnn
      885, W162, W524
\expl@@@filehook@file@push@@ ...
      U843, W151, W520
\expl@@@filehook@if@file@replaced@@TF
      888, 890, W290, W313, W334, W514
\expl@@@filehook@if@no@extension@@nTF
      W286,
W309, W330, W504, W506, W531
\expl@@@filehook@normalize@file@name@@w
      W292, W315, W336, W512
\expl@@@filehook@resolve@file@subst@w
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\expl@@@mark@update@dbcol@structures@@
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\expl@@@mark@update@singlecol@structures@@
      S368, S382, Y471
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      X415, X500
\expl@@@shipout@add@background@picture@@n
      X415, X504
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      e139, e150, f610
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\expl@pop@filename@@ .....
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      104, e141, e152, f706
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      r314, r375, U845, W152, W364
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U559, U717, U718, U722, U724,
U752, U753, U779, U780, U807, U1016
\fileswith@ptions .....
      U712, U713, U715, U719
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K418, K487, L385, P477, P495, P513
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- \@inpenc@test ..... aa356, aa423
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 w=ltfssaxes.dtx, x=ltfssstrc.dtx, y=ltfsscmp.dtx, z=ltfssdcl.dtx, A=ltfssini.dtx,  
 B=fontdef.dtx, C=preload.dtx, D=ltfntcmd.dtx, E=lttextcomp.dtx, F=ltpageno.dtx,  
 G=ltxref.dtx, H=ltmiscen.dtx, I=ltmath.dtx, J=ltlists.dtx, K=ltboxes.dtx, L=lttab.dtx,  
 M=ltpictur.dtx, N=ltthm.dtx, O=ltsect.dtx, P=ltfloat.dtx, Q=ltidxglo.dtx, R=ltbibl.dtx,  
 S=ltmarks.dtx, T=ltpage.dtx, U=ltclass.dtx, V=ltkeys.dtx, W=ltfilehook.dtx,  
 X=ltshipout.dtx, Y=ltoutput.dtx, Z=lthyphen.dtx, aa=ltfinal.dtx

<code>\topmark</code> .....	797	<code>\UTFviii@three@octets@noexpand</code>	aa450
<code>\topmark(s)</code> .....	797	<code>\UTFviii@three@octets@string</code> ..	aa447
<code>\try@load@font@shape</code> .....	1064	<code>\UTFviii@two@octets</code> .....	
<code>\try@load@fontshape</code> .....		.....	aa408, aa413, aa419
.....	449, v372, v380,	<code>\UTFviii@two@octets@@</code> ..	aa408, aa419
<code>v426, v531, w479, x520, z318, z335</code>		<code>\UTFviii@two@octets@combine</code> ..	aa443
<code>\try@simple@size</code> .....	x356, x481	<code>\UTFviii@two@octets@noexpand</code> ..	aa449
<code>\try@simples</code> .....	x439, x445, x449	<code>\UTFviii@two@octets@string</code> ...	aa446
<code>\try@size@range</code> .....	x101, x356, x432	<code>\UTFviii@undefined@err</code> .....	
<code>\try@size@substitution</code> ...	x103, x436	.....	aa406, aa411, aa417
<code>\tryif@simple</code> .....	x447, x448	<code>\UTFviii@undefined@err@@</code>	aa406, aa417
<code>\tryis@simple</code> .....	x448	<code>\v@false</code> .....	I82
<code>\tt@def@ult</code> .....	A397	<code>\v@true</code> .....	I81, I83
<code>\ttdef@ult</code> .....		<code>\vbox</code> .....	801
...	527, A260, A283, A321, A341,	<code>\ver@...</code> .....	353
<code>A357, A368, A400, A441, E31, E88</code>		<code>\ver@@...</code> .....	353
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<code>\two@digits</code> .....	a89, a188, a189,	<code>\verb@balance@group</code> ..	H508, H510,
<code>f2, x512, U1096, U1185, U1318, U1407</code>		<code>H523, H525, H538, H540, H546, H547</code>	
<code>\type@restoreinfo</code> .....	x202, x207	<code>\verb@egroup</code> .....	H508, H511,
<code>\undeclare@...</code> .....	922	<code>H523, H526, H538, H541, H547, H551</code>	
<code>\undeclare@file@substitution</code> ...		<code>\verb@eol@error</code> ..	H548, H560, H570
.....	879, W247	<code>\verbatim@font</code> .....	1027,
<code>\unexpandable@noexpand</code> .....	1058	<code>1056, H432, H453, H461, H561, H571</code>	
<code>\unexpanded</code> .....	793	<code>\verbatim@nolig@list</code> ...	H576, H582
<code>\unqu@tefilef@und</code> .....	W143	<code>\verbatim@out</code> .....	1063
<code>\unquote@name</code> ..	r455, r461, r478, W350	<code>\version@elt</code> .....	
<code>\unrestored@protected@xdef</code> .....		.....	z18, z31, z32, z379, z380,
.....	f253, P458,	<code>z429, z449, z540, z578, z670, z1099</code>	
<code>P526, P542, P553, S141, T26, T54, T78</code>		<code>\version@list</code> .....	z16,
<code>\unskip</code> .....	801	<code>z21, z32, z372, z380, z434, z455,</code>	
<code>\update@series@target@value</code> ....		<code>z474, z545, z590, z620, z675, z1112</code>	
.....	A118, A152, A173, A244	<code>\vgl@</code> .....	b468, b469
<code>\update@ucl@with@cyrillic</code> .....		<code>\voidb@x</code> .....	b311, b499, u18
.....	s1505, s1533, s1563, s1571	<code>\vsplit</code> .....	801
<code>\upper@bound</code> ..	x383, x384, x385, x398	<code>\vss</code> .....	801
<code>\use@mathgroup</code> .....		<code>\warn@rel@i</code> .....	y5,
...	1022, v595, v613, v615, x299,	<code>y25, y29, y81, y85, y90, y95, y119, y140</code>	
<code>z63, z92, z547, z649, z652, z1119, z1143</code>		<code>\wrong@fontshape</code> ....	1021, v376, v513
<code>\UTF@two@octets@noexpand</code> .....	1089	<code>\x@protect</code> .....	1047,
<code>\UTFviii@four@octets</code> .....		<code>f231, f242, f293, f331, f359, f530, f550</code>	
.....	aa410, aa415, aa421	<code>\xe@alloc@</code> .....	aa56, aa66
<code>\UTFviii@four@octets@@</code> ..	aa410, aa421	<code>\xe@alloc@intercharclass</code> ..	1071, aa35
<code>\UTFviii@four@octets@combine</code> ..	aa445	<code>\xe@ch@ck</code> .....	aa57, aa61
<code>\UTFviii@four@octets@noexpand</code> ..	aa451	<code>\XXX@argdef</code> .....	1034
<code>\UTFviii@four@octets@string</code> ..	aa448	<code>\z@</code> .....	275, 1058, 1060, b311
<code>\UTFviii@invalid</code> .....	aa349, aa442	<code>\z@skip</code> .....	305, 1060, b311
<code>\UTFviii@invalid@err</code> .....		<code>\zap@space</code> ..	r261, r281, A546, R49,
.....	aa407, aa412, aa418	<code>U229, U390, U413, U425, U590,</code>	
<code>\UTFviii@invalid@err@@</code> ..	aa407, aa418	<code>U706, U727, U745, U756, U773,</code>	
<code>\UTFviii@three@octets</code> .....		<code>U783, U800, U828, U1109, U1240</code>	
.....	aa409, aa414, aa420	tex commands:	
<code>\UTFviii@three@octets@@</code> ..	aa409, aa420	<code>\tex_afterassignment:D</code> .....	
<code>\UTFviii@three@octets@combine</code> ..	aa444	.....	g2227, X49, X137

**File Key:** a=ltldirchk.dtx, b=ltplain.dtx, c=ltvers.dtx, d=ltluatex.dtx, e=ltexpl.dtx, f=ltdefns.dtx, g=ltcmd.dtx, h=lthooks.dtx, i=ltcmdhooks.dtx, j=ltalloc.dtx, k=ltcntrl.dtx, l=lterror.dtx, m=ltpar.dtx, n=ltpara.dtx, o=ltmeta.dtx, p=ltspc.dtx, q=ltlogos.dtx, r=ltfiles.dtx, s=ltoutenc.dtx, t=ltcounts.dtx, u=ltlength.dtx, v=ltfssbas.dtx, w=ltfssaxes.dtx, x=ltfssstrc.dtx, y=ltfsscmp.dtx, z=ltfssdcl.dtx, A=ltfssini.dtx, B=fontdef.dtx, C=preload.dtx, D=ltfntcmd.dtx, E=lttextcomp.dtx, F=ltpageno.dtx, G=ltxref.dtx, H=ltmiscen.dtx, I=ltmath.dtx, J=ltlists.dtx, K=ltboxes.dtx, L=lttab.dtx, M=ltptictur.dtx, N=ltthm.dtx, O=ltsect.dtx, P=ltfloat.dtx, Q=ltidglo.dtx, R=ltbibl.dtx, S=ltmarks.dtx, T=ltpage.dtx, U=ltclass.dtx, V=ltkeys.dtx, W=ltfilehook.dtx, X=ltshipout.dtx, Y=ltoutput.dtx, Z=lthyphen.dtx, aa=ltfinal.dtx

- `\tex_aftergroup:D` . . . 907, X57, X143
- `\tex_badness:D` . . . . . S68, S74
- `\tex_currentgrouplevel:D` . . . . .
- . . . . . X48, X56, X136, X142
- `\tex_deadcycles:D` . . . . . X91
- `\tex_endlinechar:D` . . . . .
- . . . . . g1712, g1714, g1715, g1721, i342
- `\tex_escapechar:D` . . . . .
- . . . . . 167, 168, g989, g999, g1168, g1177,
- . . . . . g1615, g2102, g2128, i199, W212, W226
- `\tex_everypar:D` . . . . .
- . . . . . 302–304, 1088, n18, n22, n26, n34,
- . . . . . n34, n74, n76, n86, n87, n138, n139
- `\tex_gdef:D` . . . . . 267, i189
- `\tex_hskip:D` . . . . . n60
- `\tex_indent:D` . . . . . n81
- `\tex_kern:D` . . . . . S65, S72
- `\tex_lastnodetype:D` . . . 306, n59, S58
- `\tex_lowercase:D` . . . . . g1978, g2108
- `\tex_marks:D` . . . . . S146
- `\tex_newlinechar:D` . . . . . i343
- `\tex_noindent:D` . . . . . 303, n24, n91
- `\tex_par:D` . . . . . 305, 306,
- . . . . . n16, n62, n69, n93, n134, n135, n136
- `\tex_parskip:D` . . . . . n23
- `\tex_setbox:D` . . . . . X50, X138
- `\tex_shipout:D` . . . X125, X378, X508
- `\tex_splitbotmarks:D` . . . . . 802, S82
- `\tex_splitfirstmarks:D` . . . . . 802, S94
- `\tex_splitmaxdepth:D` . . . . . S50
- `\tex_unskip:D` . . . . . 306, n55, S56
- `\tex_vbadness:D` . . . . . S51
- `\tex_vfuzz:D` . . . . . 801, S52
- `\tex_vss:D` . . . . . X332
- `\tex_xdef:D` . . . . . 267, i195
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- `\text_lowercase:n` . . . . . 1089, aa566
- `\text_uppercase:n` . . . . . aa567
- `\textacutecdbl` . . . . .
- . . . . . s915, s1153, E234, E235, E721, E971
- `\textascendercompwordmark` . . . . .
- . . . . . s854, E154, E685, E954
- `\textasciicircum` . . . . .
- . . . . . s965, s1114, E236, E237, E722, E995
- `\textasciibreve` . . . . .
- . . . . . s913, s1152, E238, E239, E723, E968
- `\textasciicaron` . . . . .
- . . . . . s914, s1151, E240, E241, E724, E969
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- . . . . . 1051, 1058, 1074, s286, s558, s1088
- `\textasciidieresis` . . . . .
- . . . . . s953, s1101, E242, E243, E725, E985
- `\textasciigrave` . . . . .
- . . . . . s904, s1082, E244, E245, E726, E966
- `\textasciimacron` . . . . .
- . . . . . s960, s1109, E246, E247, E727, E990
- `\textasciitilde` . . . . . 1045,
- . . . . . 1051, 1058, 1074, s287, s559, s1093
- `\textasteriskcentered` 382, 1062, 1074,
- . . . . . 1084, s267, s717, s864, s865, s1215,
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- `\textbaht` . . . . . s939,
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- `\textbar` . . . . . 1045,
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- `\textborn` . . . . . s905,
- . . . . . E256, E257, E387, E733, E1059, E1060
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- `\textbraceright` . . . . . 1045,
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- `\textcompwordmark` .. 368, 1045, 1063,  
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- `\textcopyright` ..... 1063, s283,  
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- `\textcurrency` ..... s949, s1097, E335,  
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- `\textdaggerdbl` .....  
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- `\textdblhyphenchar` ..... s912,  
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- `\textdiscount` ..... s941,  
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- `\textdiv` .. s978, s1135, E133, E657, E1005
- `\textdivorced` ..... s906,  
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- `\textdownarrow` ..... s903,  
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- `\textflorin` .....  
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- `\textfont` ..... x337, I238
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- `\textfraction` ..... 1064, Y1952,  
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