

# The `zref-check` package implementation\*

Gustavo Barros<sup>†</sup>

2022-04-22

## Contents

<b>1</b>	<b>Initial setup</b>	<b>2</b>
<b>2</b>	<b>Dependencies</b>	<b>2</b>
<b>3</b>	<b><code>zref</code> setup</b>	<b>2</b>
<b>4</b>	<b>Plumbing</b>	<b>3</b>
4.1	Messages . . . . .	3
4.2	Integer testing . . . . .	4
4.3	Options . . . . .	5
4.4	Position on page . . . . .	9
4.5	Counter . . . . .	11
4.6	Label formats . . . . .	12
4.7	Property values . . . . .	12
<b>5</b>	<b>User interface</b>	<b>14</b>
5.1	<code>\zcheck</code> . . . . .	14
5.2	Targets . . . . .	16
<b>6</b>	<b>Checks</b>	<b>16</b>
6.1	Single label checks . . . . .	17
6.2	Setup . . . . .	17
6.3	Running . . . . .	18
6.4	Conditionals . . . . .	21
6.4.1	This page . . . . .	21
6.4.2	On page . . . . .	22
6.4.3	Before / After . . . . .	23
6.4.4	Pages . . . . .	23
6.4.5	Close / Far . . . . .	26
6.4.6	Chapter . . . . .	26
6.4.7	Section . . . . .	28
<b>7</b>	<b><code>zref-clever</code> integration</b>	<b>30</b>

---

\*This file describes v0.3.0, released 2022-04-22.

<sup>†</sup><https://github.com/gusbrs/zref-check>

<b>8</b>	<b>zref-vario integration</b>	<b>31</b>
<b>Index</b>		<b>31</b>

## 1 Initial setup

Start the DocStrip guards.

```
1 <*package>
```

Identify the internal prefix (L<sup>A</sup>T<sub>E</sub>X3 DocStrip convention).

```
2 <@@=zrefcheck>
```

For the `chapter` and `section` checks, `zref-check` uses the new hook system in `ltxcmds`, which was released with the 2021/06/01 L<sup>A</sup>T<sub>E</sub>X kernel.

```
3 \providecommand\IfFormatAtLeastTF{\@ifl@t@r\fmtversion}
4 \IfFormatAtLeastTF{2021-06-01}
5 {}
6 {%
7   \PackageError{zref-check}{LaTeX kernel too old}
8   {%
9     'zref-check' requires a LaTeX kernel newer than 2021-06-01.%
10    \MessageBreak Loading will abort!%
11   }%
12 \endinput
13 }%
```

Identify the package.

```
14 \ProvidesExplPackage {zref-check} {2022-04-22} {0.3.0}
15 {Flexible cross-references with contextual checks based on zref}
```

## 2 Dependencies

```
16 \RequirePackage { zref-user }
17 \RequirePackage { zref-abspage }
18 \RequirePackage { ifdraft }
```

## 3 zref setup

`\g__zrefcheck_abschap_int` Provide absolute counters for section and chapter, and respective `zref` properties, so that we can make checks about relation of chapters/sections regardless of internal counters, since we don't get those for the unnumbered (starred) ones. Thanks Ulrike Fischer for suggestions at TeX.SX about the proper place to make the hooks for this purpose.

```
19 \int_new:N \g__zrefcheck_abschap_int
20 \int_new:N \g__zrefcheck_abssec_int
```

(End definition for `\g__zrefcheck_abschap_int` and `\g__zrefcheck_abssec_int`.)

If the documentclass does not define `\chapter` the only thing that happens is that the chapter counter is never incremented, and the section one never reset.

```
21 \AddToHook { cmd / chapter / before }
22 {
23   \int_gincr:N \g__zrefcheck_abschap_int
24   \int_gzero:N \g__zrefcheck_abssec_int
```

```

25 }
26 \zref@newprop { zc@abschap } [0] { \int_use:N \g__zrefcheck_abschap_int }
27 \zref@addprop \ZREF@mainlist { zc@abschap }
28 \AddToHook { cmd / section / before }
29 { \int_gincr:N \g__zrefcheck_abssec_int }
30 \zref@newprop { zc@abssec } [0] { \int_use:N \g__zrefcheck_abssec_int }
31 \zref@addprop \ZREF@mainlist { zc@abssec }

```

These are the lists of properties to be used by zref-check, that is, the list of properties the references and targets store. This is the minimum set required, more properties may be added according to options. For user facing labels, we must use the `main` property list, so that zref-clever can also retrieve the properties it needs to refer to them.

```

32 \zref@newlist { zrefcheck-check }
33 \zref@addprops { zrefcheck-check }
34 {
35   page , % for messages
36   abspage ,
37   zc@abschap ,
38   zc@abssec
39 }
40 \zref@newlist { zrefcheck-end }
41 \zref@addprops { zrefcheck-end }
42 {
43   abspage ,
44   zc@abschap ,
45   zc@abssec
46 }

```

For zref-vario we only need page information, since we only perform above and below checks there.

```

47 \zref@newlist { zrefcheck-zrefvario }
48 \zref@addprops { zrefcheck-zrefvario }
49 {
50   page , % for messages
51   abspage ,
52 }

```

## 4 Plumbing

### 4.1 Messages

```

\__zrefcheck_message:nnnn
\__zrefcheck_message:nnnx
53 \cs_new_protected:Npn \__zrefcheck_message:nnnn #1#2#3#4
54 {
55   \use:c { msg_ \l__zrefcheck_msglevel_tl :nnnnn }
56   { zref-check } {#1} {#2} {#3} {#4}
57 }
58 \cs_generate_variant:Nn \__zrefcheck_message:nnnn { nnxx }

```

(End definition for `\__zrefcheck_message:nnnn`.)

```

59 \msg_new:nnn { zref-check } { check-failed }
60 { Failed~check~'~#1'~for~label~'~#2'~on~page~#3~\msg_line_context:. }
61 \msg_new:nnn { zref-check } { double-check }

```

```

62 { Double-check~'#1'~for~label~'#2'~on~page~#3~\msg_line_context:. }
63 \msg_new:nnn { zref-check } { check-missing }
64 { Check~'#1'~not~defined~\msg_line_context:. }
65 \msg_new:nnn { zref-check } { property-undefined }
66 { Property~'#1'~not~defined~\msg_line_context:. }
67 \msg_new:nnn { zref-check } { property-not-in-label }
68 { Label~'#1'~has~no~property~'#2'~\msg_line_context:. }
69 \msg_new:nnn { zref-check } { property-not-integer }
70 { Property~'#1'~for~label~'#2'~not~an~integer~\msg_line_context:. }
71 \msg_new:nnn { zref-check } { hyperref-preamble-only }
72 {
73   Option~'hyperref'~only~available~in~the~preamble. \iow_newline:
74   Use~the~starred~version~of~'\iow_char:N\zcheck'~instead.
75 }
76 \msg_new:nnn { zref-check } { missing-hyperref }
77 { Missing~'hyperref'~package. \iow_newline: Setting~'hyperref=false'. }
78 \msg_new:nnn { zref-check } { ignore-document-only }
79 {
80   Option~'ignore'~only~available~in~the~document. \iow_newline:
81   Use~option~'msglevel'~instead.
82 }
83 \msg_new:nnn { zref-check } { option-preamble-only }
84 { Option~'#1'~only~available~in~the~preamble~\msg_line_context:. }
85 \msg_new:nnn { zref-check } { closerange-not-positive-integer }
86 {
87   Option~'closerange'~not~a~positive~integer~\msg_line_context:.~
88   Using~default~value.
89 }
90 \msg_new:nnn { zref-check } { labelcmd-undefined }
91 {
92   Control~sequence~named~'#1'~used~in~option~'labelcmd'~is~not~defined.~
93   Using~default~value.
94 }
95 \msg_new:nnn { zref-check } { option-deprecated-with-alternative }
96 {
97   Option~'#1'~has~been~deprecated~\msg_line_context:.\iow_newline:
98   Use~'#2'~instead.
99 }
100 \msg_new:nnn { zref-check } { option-deprecated }
101 { Option~'#1'~has~been~deprecated~\msg_line_context:. }
102 \msg_new:nnn { zref-check } { load-time-options }
103 {
104   'zref-check'~does~not~accept~load~time~options.~
105   To~configure~package~options,~use~'\iow_char:N\zrefchecksetup'.
106 }

```

## 4.2 Integer testing

`__zrefcheck_is_integer:n` From <https://tex.stackexchange.com/a/244405> (thanks Enrico Gregorio, aka 'egreg'),  
`__zrefcheck_int_to_roman:w` also see <https://tex.stackexchange.com/a/19769>. Following the `l3styleguide`, I  
made a copy of `__int_to_roman:w`, since it is an internal function from the `int`  
module, but we still get a warning from `l3build doc`, complaining about it. And  
we're using `\tl_if_empty:oTF` instead of `\tl_if_blank:oTF` as in egreg's answer, since

`\romannumeral` is defined so that “the expansion is empty if the number is zero or negative”, not “blank”. A couple of comments about this technique: the underlying `\romannumeral` ignores space tokens and explicit signs (+ and -) in the expansion and hence it can only be used to test positive integers; also the technique cannot distinguish whether it received an empty argument or if “the expansion was empty” as a result of receiving number as argument, so this must also be controlled for since, in our use case, this may happen.

```

107 \cs_new_eq:NN \__zrefcheck_int_to_roman:w \__int_to_roman:w
108 \prg_new_conditional:Npnn \__zrefcheck_is_integer:n #1 { p, T , F , TF }
109 {
110   \tl_if_empty:oTF {#1}
111   { \prg_return_false: }
112   {
113     \tl_if_empty:oTF { \__zrefcheck_int_to_roman:w -0#1 }
114     { \prg_return_true: }
115     { \prg_return_false: }
116   }
117 }
```

(End definition for `\__zrefcheck_is_integer:n` and `\__zrefcheck_int_to_roman:w`.)

`\__zrefcheck_is_integer_rgx:n` A possible alternative to `\__zrefcheck_is_integer:n` is to use a straightforward regexp match (see <https://tex.stackexchange.com/a/427559>). It does not suffer from the mentioned caveats from the `\__int_to_roman:w` technique, however, while `\__zrefcheck_is_integer:n` is expandable, `\__zrefcheck_is_integer_rgx:n` is not. Also, `\__zrefcheck_is_integer_rgx:n` is probably slower.

```

118 \prg_new_protected_conditional:Npnn \__zrefcheck_is_integer_rgx:n #1 { TF }
119 {
120   \regex_match:nnTF { \A\d+\Z } {#1}
121   { \prg_return_true: }
122   { \prg_return_false: }
123 }
```

(End definition for `\__zrefcheck_is_integer_rgx:n`.)

## 4.3 Options

### hyperref option

```

\l__zrefcheck_use_hyperref_bool
\l__zrefcheck_warn_hyperref_bool
124 \bool_new:N \l__zrefcheck_use_hyperref_bool
125 \bool_new:N \l__zrefcheck_warn_hyperref_bool
126 \keys_define:nn { zref-check }
127 {
128   hyperref .choice: ,
129   hyperref / auto .code:n =
130   {
131     \bool_set_true:N \l__zrefcheck_use_hyperref_bool
132     \bool_set_false:N \l__zrefcheck_warn_hyperref_bool
133   } ,
134   hyperref / true .code:n =
135   {
136     \bool_set_true:N \l__zrefcheck_use_hyperref_bool
```

```

137         \bool_set_true:N \l__zrefcheck_warn_hyperref_bool
138     } ,
139     hyperref / false .code:n =
140     {
141         \bool_set_false:N \l__zrefcheck_use_hyperref_bool
142         \bool_set_false:N \l__zrefcheck_warn_hyperref_bool
143     } ,
144     hyperref .initial:n = auto ,
145     hyperref .default:n = auto
146 }

```

(End definition for \l\_\_zrefcheck\_use\_hyperref\_bool and \l\_\_zrefcheck\_warn\_hyperref\_bool.)

```

147 \AddToHook { begindocument }
148 {
149     \@ifpackageloaded { hyperref }
150     {
151         \bool_if:NT \l__zrefcheck_use_hyperref_bool
152         { \RequirePackage { zref-hyperref } }
153     }
154     {
155         \bool_if:NT \l__zrefcheck_warn_hyperref_bool
156         { \msg_warning:nn { zref-check } { missing-hyperref } }
157         \bool_set_false:N \l__zrefcheck_use_hyperref_bool
158     }
159     \keys_define:nn { zref-check }
160     {
161         hyperref .code:n =
162         { \msg_warning:nn { zref-check } { hyperref-preamble-only } }
163     }
164 }

```

### msglevel option

\l\_\_zrefcheck\_msglevel\_tl

```

165 \tl_new:N \l__zrefcheck_msglevel_tl
166 \keys_define:nn { zref-check }
167 {
168     msglevel .choice: ,
169     msglevel / warn .code:n =
170     { \tl_set:Nn \l__zrefcheck_msglevel_tl { warning } } ,
171     msglevel / info .code:n =
172     { \tl_set:Nn \l__zrefcheck_msglevel_tl { info } } ,
173     msglevel / none .code:n =
174     { \tl_set:Nn \l__zrefcheck_msglevel_tl { none } } ,
175     msglevel / infoifdraft .code:n =
176     {
177         \ifdraft
178         { \tl_set:Nn \l__zrefcheck_msglevel_tl { info } }
179         { \tl_set:Nn \l__zrefcheck_msglevel_tl { warning } }
180     } ,
181     msglevel / warniffinal .code:n =
182     {
183         \ifoptionfinal
184         { \tl_set:Nn \l__zrefcheck_msglevel_tl { warning } }

```

```

185         { \tl_set:Nn \l__zrefcheck_msglevel_tl { info } }
186     } ,
187     msglevel / obeydraft .code:n =
188     {
189         % NOTE Option value deprecated in 2021-12-07 for v0.2.2.
190         \msg_warning:nnnn { zref-check }{ option-deprecated-with-alternative }
191         { msglevel=obeydraft } { msglevel=infoifdraft }
192     } ,
193     msglevel / obeyfinal .code:n =
194     {
195         % NOTE Option value deprecated in 2021-12-07 for v0.2.2.
196         \msg_warning:nnnn { zref-check }{ option-deprecated-with-alternative }
197         { msglevel=obeyfinal } { msglevel=warniffinal }
198     } ,
199     msglevel .value_required:n = true ,
200     msglevel .initial:n = warn ,

```

`ignore` is a convenience alias for `msglevel=none`, but only for use in the document body.

```

201     ignore .code:n =
202     { \msg_warning:nn { zref-check } { ignore-document-only } } ,
203     ignore .value_forbidden:n = true
204 }

```

*(End definition for \l\_\_zrefcheck\_msglevel\_tl.)*

```

205 \AddToHook { begindocument }
206 {
207     \keys_define:nn { zref-check }
208     { ignore .meta:n = { msglevel = none } }
209 }

```

## onpage option

`\l__zrefcheck_msgonpage_bool`

```

210 \bool_new:N \l__zrefcheck_msgonpage_bool
211 \keys_define:nn { zref-check }
212 {
213     onpage .choice: ,
214     onpage / labelseq .code:n =
215     {
216         \bool_set_false:N \l__zrefcheck_msgonpage_bool
217     } ,
218     onpage / msg .code:n =
219     {
220         \bool_set_true:N \l__zrefcheck_msgonpage_bool
221     } ,
222     onpage / labelseqifdraft .code:n =
223     {
224         \ifdraft
225         { \bool_set_false:N \l__zrefcheck_msgonpage_bool }
226         { \bool_set_true:N \l__zrefcheck_msgonpage_bool }
227     } ,
228     onpage / msgiffinal .code:n =
229     {
230         \ifoptionfinal

```

```

231         { \bool_set_true:N \l__zrefcheck_msgonpage_bool }
232         { \bool_set_false:N \l__zrefcheck_msgonpage_bool }
233     } ,
234     onpage / obeydraft .code:n =
235     {
236         % NOTE Option value deprecated in 2021-12-07 for v0.2.2.
237         \msg_warning:nnnn { zref-check }{ option-deprecated-with-alternative }
238         { onpage=obeydraft } { onpage=labelseqifdraft }
239     } ,
240     onpage / obeyfinal .code:n =
241     {
242         % NOTE Option value deprecated in 2021-12-07 for v0.2.2.
243         \msg_warning:nnnn { zref-check }{ option-deprecated-with-alternative }
244         { onpage=obeyfinal } { onpage=msgiffinal }
245     } ,
246     onpage .value_required:n = true ,
247     onpage .initial:n = labelseq
248 }

```

(End definition for \l\_\_zrefcheck\_msgonpage\_bool.)

### closerange option

\l\_\_zrefcheck\_close\_range\_int

```

249 \int_new:N \l__zrefcheck_close_range_int
250 \keys_define:nn { zref-check }
251 {
252     closerange .code:n =
253     {
254         \__zrefcheck_is_integer_rgx:nTF {#1}
255         { \int_set:Nn \l__zrefcheck_close_range_int { \int_eval:n {#1} } }
256         {
257             \msg_warning:nn { zref-check } { closerange-not-positive-integer }
258             \int_set:Nn \l__zrefcheck_close_range_int { 5 }
259         }
260     } ,
261     closerange .value_required:n = true ,
262     closerange .initial:n = 5
263 }

```

(End definition for \l\_\_zrefcheck\_close\_range\_int.)

### labelcmd option

```

264 \keys_define:nn { zref-check }
265 {
266     labelcmd .code:n =
267     {
268         % NOTE Option value deprecated in 2022-02-08 for v0.2.4.
269         \msg_warning:nnn { zref-check }{ option-deprecated }
270         { labelcmd }
271     } ,
272 }

```



## Package options

zref-check does not accept load-time options. Despite the tradition of so doing, Joseph Wright has a point in recommending otherwise at <https://chat.stackexchange.com/transcript/message/60360822#60360822>: separating “loading the package” from “configuring the package” grants less trouble with “option clashes” and with expansion of options at load-time.

```
273 \bool_lazy_and:nnT
274 { \tl_if_exist_p:c { opt@ zref-check.sty } }
275 { ! \tl_if_empty_p:c { opt@ zref-check.sty } }
276 { \msg_warning:nn { zref-check } { load-time-options } }
```

`\zrefchecksetup` Provide `\zrefchecksetup`.

```
277 \NewDocumentCommand \zrefchecksetup { m }
278 { \keys_set:nn { zref-check } {#1} }
```

*(End definition for \zrefchecksetup.)*

## 4.4 Position on page

Method for determining relative position within the page: the sequence in which the labels get shipped out, inferred from the sequence in which the labels occur in the `.aux` file.

Some relevant info about the sequence of things: <https://tex.stackexchange.com/a/120978> and `texdoc lthooks`, section “Hooks provided by `\begin{document}`”.

One first attempt at this was to use `\zref@newlabel`, which is the macro in which `zref` stores the label information in the aux file. When the `.aux` file is read at the beginning of the compilation, this macro is expanded for each of the labels. So, by redefining this macro we can feed a variable (a L<sup>3</sup> sequence), and then do what it usually does, which is to define each label with the internal macro `\@newl@bel`, when the `.aux` file is read.

Patching this macro for this is not possible. First, `\zref@newlabel` is one of those “commands that look ahead” mentioned in `ltxcmdhooks` documentation. Indeed, `\@newl@bel` receives 3 arguments, and `\zref@newlabel` just passes the first, the following two will be scanned ahead. Second, the `ltxcmdhooks` hooks are not actually available when the `.aux` file is read, they come only after `\begin{document}`. Hence, redefinition would be the only alternative. My attempts at this ended up registered at <https://tex.stackexchange.com/a/604744>. But the best result in these lines was:

```
\ZREF@Robust\edef\zref@newlabel#1{
  \noexpand\seq_gput_right:Nn \noexpand\g__zrefcheck_auxfile_lblseq_seq {#1}
  \noexpand\@newl@bel{\ZREF@RefPrefix}{#1}
}
```

However, better than the above is to just read it from the `.aux` file directly, which relieves us from hacking into any internals. That’s what David Carlisle’s answer at <https://tex.stackexchange.com/a/147705> does. This answer has actually been converted into the package `listbls` by Norbert Melzer, but it is made to work with regular labels, not with `zref`’s. And it also does not really expose the information in a retrievable way (as far as I can tell). So, the below is adapted from Carlisle’s answer’s technique (a poor man’s version of it...).

There is some subtlety here as to whether this approach makes it safe for us to read the labels at this point without `\zref@wrapper@babel`. The common wisdom is that babel’s shorthands are only active after `\begin{document}` (e.g., <https://tex.stackexchange.com/a/98897>). Alas, it is more complicated than that. Babel’s documentation says (in section 9.5 Shorthands): “To prevent problems with the loading of other packages after babel we reset the catcode of the character to the original one at the end of the package and of each language file (except with `KeepShorthandsActive`). It is re-activate[d] again at `\begin{document}`. We also need to make sure that the shorthands are active during the processing of the `.aux` file. Otherwise some citations may give unexpected results in the printout when a shorthand was used in the optional argument of `\bibitem` for example.” This is done with `\if@files\write\@mainaux{...}`. In other words, the catcode change is written in the `.aux` file itself! Indeed, if you inspect the file, you’ll find them there. Besides, there is still the ominous “except with `KeepShorthandsActive`”.

However, the *method* we’re using here is not quite the same as the usual run of the `.aux` file, because we’re actively discarding the lines for which the first token is not equal to `\zref@newlabel`. I have tested the famous sensitive case for this: `babel french` and labels with colons. And things worked as expected. Well, *if* `KeepShorthandsActive` is enabled *with french* and we load the package *after babel* things do break, but not quite because of the colons in the labels. Even `siunitx` breaks in the same conditions...

For reference: About what are valid characters for use in labels: <https://tex.stackexchange.com/a/18312>. About some problems with active colons: <https://tex.stackexchange.com/a/89470>. About the difference between L3 strings and token lists, see <https://tex.stackexchange.com/a/446381>, in particular Joseph Wright’s comment: “Strings are for data that will never be typeset, for example file names, identifiers, etc.: if the material may be used in typesetting, it should be a token list.” See also moewe’s (CW) answer in the same lines. Which suggests using L3 strings for the reference labels might be a good catch all approach, and possibly more robust. David Carlisle’s comment about `inputenc` and how the strings work is a caveat (see [https://tex.stackexchange.com/q/446123#comment1516961\\_446381](https://tex.stackexchange.com/q/446123#comment1516961_446381), thanks David Carlisle). Still... let’s stick to tradition as long as it works, `zref` already does a great job in this regard anyway.

`\g_zrefcheck_auxfile_lblseq_prop`

```
279 \prop_new:N \g_zrefcheck_auxfile_lblseq_prop
```

(End definition for `\g_zrefcheck_auxfile_lblseq_prop`.)

```
280 \tl_gset:Nn \g_tmpa_tl { \c_sys_jobname_str .aux }
```

```
281 \file_if_exist:nT { \g_tmpa_tl }
```

```
282 {
```

Retrieve the information from the `.aux` file, and store it in a property list, so that the sequence can be retrieved in key-value fashion.

```
283 \ior_open:Nn \g_tmpa_ior { \g_tmpa_tl }
```

```
284 \group_begin:
```

```
285 \int_zero:N \l_tmpa_int
```

```
286 \tl_clear:N \l_tmpa_tl
```

```
287 \tl_clear:N \l_tmpb_tl
```

```
288 \bool_set_false:N \l_tmpa_bool
```

```
289 \ior_map_variable:NNn \g_tmpa_ior \l_tmpa_tl
```

```
290 {
```

```

291         \tl_map_variable:NNn \l_tmpa_tl \l_tmpb_tl
292         {
293             \tl_if_eq:NnTF \l_tmpb_tl { \zref@newlabel }
294             {

```

Found a `\zref@label`, signal it.

```

295         \bool_set_true:N \l_tmpa_bool
296     }
297     {
298         \bool_if:NTF \l_tmpa_bool
299         {
300             \bool_set_false:N \l_tmpa_bool
301             \int_incr:N \l_tmpa_int
302             \prop_gput:Nxx \g__zrefcheck_auxfile_lblseq_prop
303             { \l_tmpb_tl } { \int_use:N \l_tmpa_int }
304         }
305     }

```

If there is not a match of the first token with `\zref@newlabel`, break the loop and discard the rest of the line, to ensure no babel calls to `\catcode` in the `.aux` file get expanded. This also breaks the loop and discards the rest of the `\zref@newlabel` lines after we got the label we wanted, since we reset `\l_tmpa_bool` in the T branch.

```

306         \tl_map_break:
307     }
308 }
309 }
310 }
311 \group_end:
312 \ior_close:N \g_tmpa_ior
313 }

```

The alternate method I had considered (more than that...) for this was using `yx` coordinates supplied by `zref`’s `savepos` module. However, this approach brought in a number of complexities, including the need to patch either `\zref@label` or `\ZREF@label`. In addition, the technique was at the bottom fundamentally flawed. Ulrike Fischer was very much right when she said that “structure and position are two different beasts” (<https://github.com/ho-tex/zref/issues/12#issuecomment-880022576>). It is true that the checks based on it behaved decently, in normal circumstances, and except for outrageous label placement by the user, it would return the expected results. We don’t really need exact coordinates to decide “above/below”. Besides, it would do an exact job for the dedicated target macros of this package. It is also true that the “page” for `\pageref` is stored with the value of where the `\label` is placed, wherever that may be. However, I could not conceive a situation where the `yx` criterion would perform clearly better than the `labelseq` one. And, if that’s the case, and considering the complications it brings, this check was a slippery slope. All in all, I’ve decided to drop it.

There’s an interesting answer by David Carlisle at <https://tex.stackexchange.com/a/419189> to decide whether to typeset “above” or “below” using a method which essentially boils down to “position in the `.aux` file”.

## 4.5 Counter

We need a dedicated counter for the labels generated by the checks and targets. The value of the counter is not relevant, we just need it to be able to set proper anchors with

`\refstepcounter`. And, since I couldn't find a `\refstepcounter` equivalent in L3, we use a standard 2e counter here. I'm also using the technique to ensure the counter is never reset that is used by `zref-abspage.sty` and `\zref@require@unique`. Indeed, the requirements are the same, we need numbers ensured to be *unique* in the counter.

```

314 \begingroup
315 \let \@addtoreset \ltx@gobbletwo
316 \newcounter { zrefcheck }
317 \endgroup
318 \setcounter { zrefcheck } { 0 }

```

## 4.6 Label formats

```

\__zrefcheck_check_lblfmt:n \__zrefcheck_check_lblfmt:n {<check id int>}
319 \cs_new:Npn \__zrefcheck_check_lblfmt:n #1 { zrefcheck@ \int_use:N #1 }
(End definition for \__zrefcheck_check_lblfmt:n.)

```

```

\__zrefcheck_end_lblfmt:n \__zrefcheck_end_lblfmt:n {<label>}
320 \cs_new:Npn \__zrefcheck_end_lblfmt:n #1 { #1 @zrefcheck }
(End definition for \__zrefcheck_end_lblfmt:n.)

```

## 4.7 Property values

`\zrefcheck_get_astl:nnn` A convenience function to retrieve property values from labels. Uses `\g__zrefcheck_auxfile_lblseq_prop` for `lblseq`, and calls `\zref@extractdefault` for everything else.

We cannot use the “return value” of `\__zrefcheck_get_astl:nnn` or `\__zrefcheck_get_asint:nnn` directly, because we need to use the retrieved property values as arguments in the checks, however we use here a number of non-expandable operations. Hence, we receive a local `tl/int` variable as third argument and set that, so that it is available (and expandable) at the place of use, and also make these functions ‘protected’ (see egreg’s <https://tex.stackexchange.com/a/572903>: “a function that performs assignments should be protected”). For this reason, we do not group here, because we are passing a local variable around, but it is expected this function will be called within a group.

We’re returning `\c_empty_tl` in case of failure to find the intended property value (explicitly in `\zref@extractdefault`, but that is also what `\tl_clear:N` does).

```

\zrefcheck_get_astl:nnn {<label>} {<prop>} {<tl var>}
321 \cs_new_protected:Npn \zrefcheck_get_astl:nnn #1#2#3
322 {
323   \tl_clear:N #3
324   \tl_if_eq:nnTF {#2} { lblseq }
325   {
326     \prop_get:NnNF \g__zrefcheck_auxfile_lblseq_prop {#1} #3
327     {
328       \msg_warning:nnnn { zref-check }
329       { property-not-in-label } {#1} {#2}
330     }
331   }
332   {

```

There are three things we need to check to ensure the information we are trying to retrieve here exists: the existence of  $\{\langle label \rangle\}$ , the existence of  $\{\langle prop \rangle\}$ , and whether the particular label being queried actually contains the property. If that's all in place, the value is passed to the checks, and it's their responsibility to verify the consistency of this value.

The existence of the label is an user facing issue, and a warning for this is placed in `\__zrefcheck_zcheck:nnnnn` (and done with `\zref@refused`). We do check here though for definition with `\zref@ifrefundefined` and silently do nothing if it is undefined, to reduce irrelevant warnings in a fresh compilation round. The other two are more “internal” problems, either some problem with the checks, or with the configuration of `zref` for their consumption.

```

333     \zref@ifrefundefined {#1}
334     {}
335     {
336         \zref@ifpropundefined {#2}
337         { \msg_warning:nnnn { zref-check } { property-undefined } {#2} }
338         {
339             \zref@ifrefcontainsprop {#1} {#2}
340             {
341                 \tl_set:Nx #3
342                 { \zref@extractdefault {#1} {#2} { \c_empty_tl } }
343             }
344             {
345                 \msg_warning:nnnn
346                 { zref-check } { property-not-in-label } {#1} {#2}
347             }
348         }
349     }
350 }
351 }

```

(End definition for `\zrefcheck_get_astl:nnn`.)

`\l__zrefcheck_integer_bool` `\zrefcheck_get_asint:nnn` is a very convenient wrapper around the more general `\zrefcheck_get_astl:nnn`, since almost always we'll be wanting to compare numbers in the checks. However, it is quite hard for it to ensure an integer is *always* returned in the case of errors. And those do occur, even in a well structured document (e.g., in a first round of compilation). To complicate things, the L3 integer predicates are *very* sensitive to receiving any other kind of data, and they *scream*. To handle this `\zrefcheck_get_asint:nnn` uses `\l__zrefcheck_integer_bool` to signal if an integer could not be returned. To use this function always set `\l__zrefcheck_integer_bool` to true first, then call it as much as you need. If any of these calls got is returning anything which is not an integer, `\l__zrefcheck_integer_bool` will have been set to false, and you should check that this hasn't happened before actually comparing the integers (`\bool_lazy_and:nnTF` is your friend).

```

352 \bool_new:N \l__zrefcheck_integer_bool

```

(End definition for `\l__zrefcheck_integer_bool`.)

`\l__zrefcheck_propval_tl`

```

353 \tl_new:N \l__zrefcheck_propval_tl

```

(End definition for `\l__zrefcheck_propval_tl`.)

```

\zrefcheck_get_asint:nnn      \zrefcheck_get_asint:nnn {\label} {\prop} {\int var}
354 \cs_new_protected:Npn \zrefcheck_get_asint:nnn #1#2#3
355 {
356   \zrefcheck_get_astl:nnn {#1} {#2} { \l__zrefcheck_propval_tl }
357   \__zrefcheck_is_integer:nTF { \l__zrefcheck_propval_tl }
358   {

```

Make it an integer data type.

```

359       \int_set:Nn #3 { \int_eval:n { \l__zrefcheck_propval_tl } }
360   }
361   {
362     \bool_set_false:N \l__zrefcheck_integer_bool
363     \zref@ifrefundefined {#1}

```

Keep silent if ref is undefined to reduce irrelevant warnings in a fresh compilation round. Again, this is also not the point to check for undefined references, that's a task for `\__zrefcheck_zcheck:nnnn`.

```

364       { }
365       {
366         \msg_warning:nnnn { zref-check }
367         { property-not-integer } {#2} {#1}
368       }
369     }
370   }

```

(End definition for `\zrefcheck_get_asint:nnn`.)

## 5 User interface

### 5.1 `\zcheck`

`\zcheck` The `{\text}` argument of `\zcheck` should not be long, since `\hyperlink` cannot receive a long argument. Besides, there is no reason for it to be. Note, also, that hyperlinks crossing page boundaries have some known issues: <https://tex.stackexchange.com/a/182769>, <https://tex.stackexchange.com/a/54607>, <https://tex.stackexchange.com/a/179907>.

```

\zcheck*[\checks/options]{\labels}{\text}

```

```

371 \NewDocumentCommand \zcheck { s O { } m m }
372 { \zref@wrapper@babel \__zrefcheck_zcheck:nnnn {#3} {#1} {#2} {#4} }

```

(End definition for `\zcheck`.)

```

\l__zrefcheck_zcheck_labels_seq
\g__zrefcheck_id_int
\l__zrefcheck_checkbeg_tl
\l__zrefcheck_link_label_tl
\l__zrefcheck_link_anchor_tl
\l__zrefcheck_link_star_bool
373 \seq_new:N \l__zrefcheck_zcheck_labels_seq
374 \int_new:N \g__zrefcheck_id_int
375 \tl_new:N \l__zrefcheck_checkbeg_tl
376 \tl_new:N \l__zrefcheck_link_label_tl
377 \tl_new:N \l__zrefcheck_link_anchor_tl
378 \bool_new:N \l__zrefcheck_link_star_bool

```

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

`\__zrefcheck_zcheck:nnnn` An intermediate internal function, which does the actual heavy lifting, and places `{\labels}` as first argument, so that it can be protected by `\zref@wrapper@babel` in `\zcheck`. This is the same procedure as the one used in the definition of `\zref` in `zref-user.sty` for protection of `babel` active characters.

```
\__zrefcheck_zcheck:nnnn {\labels} {\langle*\rangle} {\langlechecks/options\rangle} {\langletext\rangle}
```

```
379 \cs_new_protected:Npn \__zrefcheck_zcheck:nnnn #1#2#3#4
380 {
381   \group_begin:
```

Process local options and checks.

```
382   \keys_set:nn { zref-check / zcheck } {#3}
383   \seq_set_from_clist:Nn \l__zrefcheck_zcheck_labels_seq {#1}
```

Names of the labels for this `zcheck` call.

```
384   \int_gincr:N \g__zrefcheck_id_int
385   \tl_set:Nx \l__zrefcheck_checkbeg_tl
386     { \__zrefcheck_check_lblfmt:n { \g__zrefcheck_id_int } }
```

Set `checkbeg` label.

```
387   \zref@labelbylist { \l__zrefcheck_checkbeg_tl } { zrefcheck-check }
```

Typeset `{\langletext\rangle}`, with hyperlink when appropriate. Even though the first argument can receive a list of labels, there is no meaningful way to set links to multiple targets. Hence, only the first one is considered for hyperlinking.

```
388   \seq_get:NN \l__zrefcheck_zcheck_labels_seq \l__zrefcheck_link_label_tl
389   \bool_set:Nn \l__zrefcheck_link_star_bool {#2}
390   \zref@ifrefundefined { \l__zrefcheck_link_label_tl }
```

If the reference is undefined, just typeset.

```
391     {#4}
392     {
393       \bool_if:nTF
394         {
395           \l__zrefcheck_use_hyperref_bool &&
396           ! \l__zrefcheck_link_star_bool
397         }
398         {
399           \exp_args:Nx \zrefcheck_get_astl:nnn
400             { \l__zrefcheck_link_label_tl }
401             { anchor } { \l__zrefcheck_link_anchor_tl }
402           \hyperlink { \l__zrefcheck_link_anchor_tl } {#4}
403         }
404     } {#4}
405 }
```

Set `checkend` label.

```
406   \bool_if:NT \l__zrefcheck_zcheck_end_label_bool
407   {
408     \zref@labelbylist
409       { \__zrefcheck_end_lblfmt:n { \l__zrefcheck_checkbeg_tl } }
410       { zrefcheck-end }
411   }
```

Check if `\langlelabels\rangle` are defined.

```
412   \seq_map_function:NN \l__zrefcheck_zcheck_labels_seq \zref@refused
```

Run the checks.

```

413     \_zrefcheck_run_checks:nmx { \l_zrefcheck_zcheck_checks_seq }
414     { \l_zrefcheck_zcheck_labels_seq } { \l_zrefcheck_checkbeg_tl }
415     \group_end:
416 }

```

(End definition for `\_zrefcheck_zcheck:nnnn`.)

## 5.2 Targets

```

\zctarget      \zctarget{<label>}{<text>}

417 \NewDocumentCommand \zctarget { m +m }
418 {

```

Group contents of `\zctarget` to avoid leaking the effects of `\refstepcounter` over `\@currentlabel`. The same care is not needed for `zcregion`, since the environment is already grouped.

```

419     \group_begin:
420     \refstepcounter { zrefcheck }
421     \zref@wrapper@babel \zref@label {#1}
422     #2
423     \tl_if_empty:nF {#2}
424     {
425         \zref@wrapper@babel
426         \zref@labelbylist { \_zrefcheck_end_lblfmt:n {#1} } { zrefcheck-end }
427     }
428     \group_end:
429 }

```

(End definition for `\zctarget`.)

```

\begin{zcregion}{<label>}
...
\end{zcregion}

zcregion      \begin{zcregion}{<label>}
              ...
              \end{zcregion}

430 \NewDocumentEnvironment {zcregion} { m }
431 {
432     \refstepcounter { zrefcheck }
433     \zref@wrapper@babel \zref@label {#1}
434 }
435 {
436     \zref@wrapper@babel
437     \zref@labelbylist { \_zrefcheck_end_lblfmt:n {#1} } { zrefcheck-end }
438 }

```

(End definition for `zcregion`.)

## 6 Checks

What is needed define a zref-check check?

First, a conditional function defined with:

```
\prg_new_protected_conditional:Npnn \_zrefcheck_check_<check>:nn #1#2 { F }
```

where `<check>` is the name of the check, the first argument is the `{<label>}` and the second the `{<reference>}`. The existence of the check is verified by the existence of the function



with this name-scheme (and signatures). As usual, this function must return either `\prg_return_true:` or `\prg_return_false:`. Of course, you can define other variants if you need them internally, it is just that what the package does expect and verifies is the existence of the `:nnF` variant.

Note that the naming convention of the checks adopts the perspective of the *<reference>*. That is, the “before” check should return true if the *<label>* occurs before the “reference”.

The check conditionals are expected to retrieve `zref`’s label information with `\zrefcheck_get_astl:nnn` or `\zrefcheck_get_asint:nnn`. Also, technically speaking, the *<reference>* argument is also a label, actually a pair of them, as set by `\zcheck`. For the “labels”, any `zref` property in `zref`’s main list is available, the “references” store the properties in the `zrefcheck` list. Besides those, there is also the `lblseq` (fake) property (for either “labels” or “references”), stored in `\g__zrefcheck_auxfile_lblseq_prop`.

Second, the required properties of labels and references must be duly registered for `zref`. This can be done with `\zref@newprop`, `\zref@addprop` and friends, as usual.

Third, the check must be registered as a key which gets setup in `\zcheck` by the `zref-check / zcheck` key set.

Fourth, if the check requires only a single label to work, it should be registered in `\c__zrefcheck_single_label_checks_seq`.

## 6.1 Single label checks

Some checks do not require an “end label” in `\zcheck`, notably the sectioning ones, which don’t rely on page boundaries. Hence, in case `\zcheck` only calls checks in this set, we can spare the setting of the end label.

`\c__zrefcheck_single_label_checks_seq`

```

439 \seq_const_from_clist:Nn \c__zrefcheck_single_label_checks_seq
440 {
441   thischap ,
442   prevchap ,
443   nextchap ,
444   chapsbefore ,
445   chapsafter ,
446   thissec ,
447   prevsec ,
448   nextsec ,
449   secsbefore ,
450   secsafter ,
451 }
```

(End definition for `\c__zrefcheck_single_label_checks_seq`.)

## 6.2 Setup

`\l__zrefcheck_zcheck_checks_seq`  
`\l__zrefcheck_end_label_required_bool`

```

452 \seq_new:N \l__zrefcheck_zcheck_checks_seq
453 \bool_new:N \l__zrefcheck_zcheck_end_label_bool
```

(End definition for `\l__zrefcheck_zcheck_checks_seq` and `\l__zrefcheck_end_label_required_bool`.)

First, we inherit all the main options into the keys of `zref-check / zcheck`.

```

454 \keys_define:nn { } { zref-check / zcheck .inherit:n = zref-check }
```

Then we add the checks to it.

```

455 \clist_map_inline:nn
456 {
457   thispage ,
458   prevpage ,
459   nextpage ,
460   facing ,
461   otherpage ,
462   pagegap ,
463   above ,
464   below ,
465   pagesbefore ,
466   ppbefore ,
467   pagesafter ,
468   ppafter ,
469   before ,
470   after ,
471   thischap ,
472   prevchap ,
473   nextchap ,
474   chapsbefore ,
475   chapsafter ,
476   thissec ,
477   prevsec ,
478   nextsec ,
479   secsbefore ,
480   secsafter ,
481   close ,
482   far ,
483 }
484 {
485   \keys_define:nn { zref-check / zcheck }
486   {
487     #1 .code:n =
488     {
489       \seq_put_right:Nn \l__zrefcheck_zcheck_checks_seq {#1}
490       \seq_if_in:NnF \c__zrefcheck_single_label_checks_seq {#1}
491       { \bool_set_true:N \l__zrefcheck_zcheck_end_label_bool }
492     } ,
493     #1 .value_forbidden:n = true ,
494   }
495 }

```

### 6.3 Running

```

\__zrefcheck_run_checks:nnn
\__zrefcheck_run_checks:nnn {<checks>} {<labels>} {<reference>}
<checks> are expected to be received as a sequence variable.
496 \cs_new_protected:Npn \__zrefcheck_run_checks:nnn #1#2#3
497 {
498   \group_begin:
499   \seq_map_inline:Nn #2
500   {
501     \seq_map_inline:Nn #1

```

```

502         { \_zrefcheck_do_check:nnn {####1} {##1} {#3} }
503     }
504     \group_end:
505 }
506 \cs_generate_variant:Nn \_zrefcheck_run_checks:nnn { nnn }

```

(End definition for \\_zrefcheck\_run\_checks:nnn.)

```

\l_zrefcheck_passedcheck_bool
\l_zrefcheck_onpage_bool
\c_zrefcheck_onpage_checks_seq
507 \bool_new:N \l_zrefcheck_passedcheck_bool
508 \bool_new:N \l_zrefcheck_onpage_bool
509 \seq_const_from_clist:Nn \c_zrefcheck_onpage_checks_seq
510 { above , below , before , after }

```

(End definition for \l\_zrefcheck\_passedcheck\_bool, \l\_zrefcheck\_onpage\_bool, and \c\_zrefcheck\_onpage\_checks\_seq.)

Variant not provided by expl3.

```

511 \cs_generate_variant:Nn \exp_args:Nnno { Nnoo }

```

```

\_zrefcheck_do_check:nnn
    \_zrefcheck_do_check:nnn {<check>} {<label beg>} {<reference beg>}
512 \cs_new_protected:Npn \_zrefcheck_do_check:nnn #1#2#3
513 {
514     \group_begin:

```

<label beg> may be defined or not, it is arbitrary user input. Whether this is the case is checked in \\_zrefcheck\_zcheck:nnnnn, and due warning already ensues. And there is no point in checking “relative position” of an undefined label. Hence, in the absence of #2, we do nothing at all here.

```

515     \zref@ifrefundefined {#2}
516     {}
517     {
518         \tl_if_empty:nF {#1}
519         {
520             \bool_set_true:N \l_zrefcheck_passedcheck_bool
521             \bool_set_false:N \l_zrefcheck_onpage_bool
522             \cs_if_exist:cTF { \_zrefcheck_check_ #1 :nnF }
523             {
524                 % ‘label beg’ vs ‘reference beg’.
525                 \use:c { \_zrefcheck_check_ #1 :nnF }
526                 {#2} {#3}
527                 { \bool_set_false:N \l_zrefcheck_passedcheck_bool }
528                 % ‘reference end’ \emph{may} exist or not depending on the
529                 % checks.
530                 \zref@ifrefundefined { \_zrefcheck_end_lblfmt:n {#3} }
531                 {
532                     % ‘label end’ \emph{may} have been created by the
533                     % target commands.
534                     \zref@ifrefundefined { \_zrefcheck_end_lblfmt:n {#2} }
535                     {}
536                     {
537                         % ‘label end’ vs ‘reference beg’.
538                         \exp_args:Nno \use:c { \_zrefcheck_check_ #1 :nnF }
539                         { \_zrefcheck_end_lblfmt:n {#2} } {#3}
540                         { \bool_set_false:N \l_zrefcheck_passedcheck_bool }

```

```

541     }
542   }
543   {
544     % ‘‘label beg’’ vs ‘‘reference end’’.
545     \exp_args:Nnno \use:c { __zrefcheck_check_ #1 :nnF }
546       {#2} { \__zrefcheck_end_lblfmt:n {#3} }
547       { \bool_set_false:N \l__zrefcheck_passedcheck_bool }
548     % ‘‘label end’’ \emph{may} have been created by the
549     % target commands.
550     \zref@ifrefundefined { \__zrefcheck_end_lblfmt:n {#2} }
551       {}
552     {
553       % ‘‘label end’’ vs ‘‘reference beg’’.
554       \exp_args:Nno \use:c { __zrefcheck_check_ #1 :nnF }
555         { \__zrefcheck_end_lblfmt:n {#2} } {#3}
556         { \bool_set_false:N \l__zrefcheck_passedcheck_bool }
557       % ‘‘label end’’ vs ‘‘reference end’’.
558       \exp_args:Nnoo \use:c { __zrefcheck_check_ #1 :nnF }
559         { \__zrefcheck_end_lblfmt:n {#2} }
560         { \__zrefcheck_end_lblfmt:n {#3} }
561         { \bool_set_false:N \l__zrefcheck_passedcheck_bool }
562     }
563   }

```

Handle option `onpage=msg`. This is only granted for tests which perform “within this page” checks (above, below, before, after) *and* if any of the two by two checks uses a “within this page” comparison. If both conditions are met, signal.

```

564     \seq_if_in:NnT \c__zrefcheck_onpage_checks_seq {#1}
565     {
566       \__zrefcheck_check_thispage:nnT
567         {#2} {#3}
568       { \bool_set_true:N \l__zrefcheck_onpage_bool }
569       \zref@ifrefundefined { \__zrefcheck_end_lblfmt:n {#3} }
570       {
571         \zref@ifrefundefined { \__zrefcheck_end_lblfmt:n {#2} }
572         {}
573         {
574           \__zrefcheck_check_thispage:nnT
575             { \__zrefcheck_end_lblfmt:n {#2} } {#3}
576             { \bool_set_true:N \l__zrefcheck_onpage_bool }
577         }
578       }
579     {
580       \__zrefcheck_check_thispage:nnT
581         {#2} { \__zrefcheck_end_lblfmt:n {#3} }
582         { \bool_set_true:N \l__zrefcheck_onpage_bool }
583       \zref@ifrefundefined { \__zrefcheck_end_lblfmt:n {#2} }
584       {}
585       {
586         \__zrefcheck_check_thispage:nnT
587           { \__zrefcheck_end_lblfmt:n {#2} } {#3}
588           { \bool_set_true:N \l__zrefcheck_onpage_bool }
589         \__zrefcheck_check_thispage:nnT
590           { \__zrefcheck_end_lblfmt:n {#2} }

```

```

591         { \__zrefcheck_end_lblfmt:n {#3} }
592         { \bool_set_true:N \l__zrefcheck_onpage_bool }
593     }
594 }
595 }
596 \bool_if:NTF \l__zrefcheck_passedcheck_bool
597 {
598     \bool_if:nT
599     {
600         \l__zrefcheck_msgonpage_bool &&
601         \l__zrefcheck_onpage_bool
602     }
603     {
604         \__zrefcheck_message:nnnx { double-check } {#1} {#2}
605         { \zref@extractdefault {#3} {page} {'unknown'} }
606     }
607 }
608 {
609     \__zrefcheck_message:nnnx { check-failed } {#1} {#2}
610     { \zref@extractdefault {#3} {page} {'unknown'} }
611 }
612 }
613 { \msg_warning:nnn { zref-check } { check-missing } {#1} }
614 }
615 }
616 \group_end:
617 }
618 \cs_generate_variant:Nn \__zrefcheck_do_check:nnn { nnV }

```

(End definition for \\_\_zrefcheck\_do\_check:nnn.)

## 6.4 Conditionals

```

\l__zrefcheck_lbl_int
\l__zrefcheck_ref_int
\l__zrefcheck_lbl_b_int
\l__zrefcheck_ref_b_int

```

More readable scratch variables for the tests.

```

619 \int_new:N \l__zrefcheck_lbl_int
620 \int_new:N \l__zrefcheck_ref_int
621 \int_new:N \l__zrefcheck_lbl_b_int
622 \int_new:N \l__zrefcheck_ref_b_int

```

(End definition for \l\_\_zrefcheck\_lbl\_int and others.)

### 6.4.1 This page

```

\__zrefcheck_check_thispage:nn
\__zrefcheck_check_otherpage:nn

```

```

623 \prg_new_protected_conditional:Npnn \__zrefcheck_check_thispage:nn #1#2 { T , F , TF }
624 {
625     \group_begin:
626         \bool_set_true:N \l__zrefcheck_integer_bool
627         \zrefcheck_get_asint:nnn {#1} { abspage } { \l__zrefcheck_lbl_int }
628         \zrefcheck_get_asint:nnn {#2} { abspage } { \l__zrefcheck_ref_int }
629         \bool_lazy_and:nnTF
630         { \l__zrefcheck_integer_bool }
631         {
632             \int_compare_p:nNn

```

```

633             { \l__zrefcheck_lbl_int } = { \l__zrefcheck_ref_int } &&

```

‘0’ is the default value of `abspage`, but this value should not happen normally for this property, since even the first page, after it gets shipped out, will receive value ‘1’. So, if we do find ‘0’ here, better signal something is wrong. This comment extends to all page number checks.

```

634             ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 } &&
635             ! \int_compare_p:nNn { \l__zrefcheck_ref_int } = { 0 }
636         }
637         { \group_insert_after:N \prg_return_true: }
638         { \group_insert_after:N \prg_return_false: }
639     \group_end:
640 }
641 \prg_new_protected_conditional:Npnn \__zrefcheck_check_otherpage:nn #1#2 { T , F , TF }
642 {
643     \__zrefcheck_check_thispage:nnTF {#1} {#2}
644     { \prg_return_false: }
645     { \prg_return_true: }
646 }

```

(End definition for `\__zrefcheck_check_thispage:nn` and `\__zrefcheck_check_otherpage:nn`.)

## 6.4.2 On page

`\__zrefcheck_check_above:nn`

`\__zrefcheck_check_below:nn`

```

647 \prg_new_protected_conditional:Npnn \__zrefcheck_check_above:nn #1#2 { F , TF }
648 {
649     \group_begin:
650     \__zrefcheck_check_thispage:nnTF {#1} {#2}
651     {
652         \bool_set_true:N \l__zrefcheck_integer_bool
653         \zrefcheck_get_asint:nnn {#1} { lblseq } { \l__zrefcheck_lbl_int }
654         \zrefcheck_get_asint:nnn {#2} { lblseq } { \l__zrefcheck_ref_int }
655         \bool_lazy_and:nnTF
656         { \l__zrefcheck_integer_bool }
657         {
658             \int_compare_p:nNn
659             { \l__zrefcheck_lbl_int } < { \l__zrefcheck_ref_int } &&
660             ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 } &&
661             ! \int_compare_p:nNn { \l__zrefcheck_ref_int } = { 0 }
662         }
663         { \group_insert_after:N \prg_return_true: }
664         { \group_insert_after:N \prg_return_false: }
665     }
666     { \group_insert_after:N \prg_return_false: }
667 \group_end:
668 }
669 \prg_new_protected_conditional:Npnn \__zrefcheck_check_below:nn #1#2 { F , TF }
670 {
671     \__zrefcheck_check_thispage:nnTF {#1} {#2}
672     {
673         \__zrefcheck_check_above:nnTF {#1} {#2}
674         { \prg_return_false: }
675         { \prg_return_true: }

```

```

676     }
677     { \prg_return_false: }
678 }

```

(End definition for `\_zrefcheck_check_above:nn` and `\_zrefcheck_check_below:nn`.)

### 6.4.3 Before / After

```

\_zrefcheck_check_before:nn
\_zrefcheck_check_after:nn
679 \prg_new_protected_conditional:Npnn \_zrefcheck_check_before:nn #1#2 { F }
680 {
681   \_zrefcheck_check_pagesbefore:nnTF {#1} {#2}
682   { \prg_return_true: }
683   {
684     \_zrefcheck_check_above:nnTF {#1} {#2}
685     { \prg_return_true: }
686     { \prg_return_false: }
687   }
688 }
689 \prg_new_protected_conditional:Npnn \_zrefcheck_check_after:nn #1#2 { F }
690 {
691   \_zrefcheck_check_pagesafter:nnTF {#1} {#2}
692   { \prg_return_true: }
693   {
694     \_zrefcheck_check_below:nnTF {#1} {#2}
695     { \prg_return_true: }
696     { \prg_return_false: }
697   }
698 }

```

(End definition for `\_zrefcheck_check_before:nn` and `\_zrefcheck_check_after:nn`.)

### 6.4.4 Pages

```

\_zrefcheck_check_nextpage:nn
\_zrefcheck_check_prevpage:nn
\_zrefcheck_check_pagesbefore:nn
\_zrefcheck_check_ppbefore:nn
\_zrefcheck_check_pagesafter:nn
\_zrefcheck_check_ppafter:nn
\_zrefcheck_check_pagegap:nn
\_zrefcheck_check_facing:nn
699 \prg_new_protected_conditional:Npnn \_zrefcheck_check_nextpage:nn #1#2 { F }
700 {
701   \group_begin:
702     \bool_set_true:N \l__zrefcheck_integer_bool
703     \zrefcheck_get_asint:nnn {#1} { abspage } { \l__zrefcheck_lbl_int }
704     \zrefcheck_get_asint:nnn {#2} { abspage } { \l__zrefcheck_ref_int }
705     \bool_lazy_and:nnTF
706       { \l__zrefcheck_integer_bool }
707       {
708         \int_compare_p:nNn
709           { \l__zrefcheck_lbl_int } = { \l__zrefcheck_ref_int + 1 } &&
710           ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 } &&
711           ! \int_compare_p:nNn { \l__zrefcheck_ref_int } = { 0 }
712       }
713     { \group_insert_after:N \prg_return_true: }
714     { \group_insert_after:N \prg_return_false: }
715   \group_end:
716 }
717 \prg_new_protected_conditional:Npnn \_zrefcheck_check_prevpage:nn #1#2 { F }

```

```

718 {
719   \group_begin:
720     \bool_set_true:N \l__zrefcheck_integer_bool
721     \zrefcheck_get_asint:nnn {#1} { abspage } { \l__zrefcheck_lbl_int }
722     \zrefcheck_get_asint:nnn {#2} { abspage } { \l__zrefcheck_ref_int }
723     \bool_lazy_and:nnTF
724       { \l__zrefcheck_integer_bool }
725       {
726         \int_compare_p:nNn
727           { \l__zrefcheck_lbl_int } = { \l__zrefcheck_ref_int - 1 } &&
728           ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 } &&
729           ! \int_compare_p:nNn { \l__zrefcheck_ref_int } = { 0 }
730       }
731       { \group_insert_after:N \prg_return_true: }
732       { \group_insert_after:N \prg_return_false: }
733   \group_end:
734 }
735 \prg_new_protected_conditional:Npnn \__zrefcheck_check_pagesbefore:nn #1#2 { F , TF }
736 {
737   \group_begin:
738     \bool_set_true:N \l__zrefcheck_integer_bool
739     \zrefcheck_get_asint:nnn {#1} { abspage } { \l__zrefcheck_lbl_int }
740     \zrefcheck_get_asint:nnn {#2} { abspage } { \l__zrefcheck_ref_int }
741     \bool_lazy_and:nnTF
742       { \l__zrefcheck_integer_bool }
743       {
744         \int_compare_p:nNn
745           { \l__zrefcheck_lbl_int } < { \l__zrefcheck_ref_int } &&
746           ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 } &&
747           ! \int_compare_p:nNn { \l__zrefcheck_ref_int } = { 0 }
748       }
749       { \group_insert_after:N \prg_return_true: }
750       { \group_insert_after:N \prg_return_false: }
751   \group_end:
752 }
753 \cs_new_eq:NN \__zrefcheck_check_ppbefore:nnF \__zrefcheck_check_pagesbefore:nnF
754 \prg_new_protected_conditional:Npnn \__zrefcheck_check_pagesafter:nn #1#2 { F , TF }
755 {
756   \group_begin:
757     \bool_set_true:N \l__zrefcheck_integer_bool
758     \zrefcheck_get_asint:nnn {#1} { abspage } { \l__zrefcheck_lbl_int }
759     \zrefcheck_get_asint:nnn {#2} { abspage } { \l__zrefcheck_ref_int }
760     \bool_lazy_and:nnTF
761       { \l__zrefcheck_integer_bool }
762       {
763         \int_compare_p:nNn
764           { \l__zrefcheck_lbl_int } > { \l__zrefcheck_ref_int } &&
765           ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 } &&
766           ! \int_compare_p:nNn { \l__zrefcheck_ref_int } = { 0 }
767       }
768       { \group_insert_after:N \prg_return_true: }
769       { \group_insert_after:N \prg_return_false: }
770   \group_end:
771 }

```



```

772 \cs_new_eq:NN \__zrefcheck_check_ppafter:nnF \__zrefcheck_check_pagesafter:nnF
773 \prg_new_protected_conditional:Npnn \__zrefcheck_check_pagegap:nn #1#2 { F }
774 {
775   \group_begin:
776   \bool_set_true:N \l__zrefcheck_integer_bool
777   \zrefcheck_get_asint:nnn {#1} { abspage } { \l__zrefcheck_lbl_int }
778   \zrefcheck_get_asint:nnn {#2} { abspage } { \l__zrefcheck_ref_int }
779   \bool_lazy_and:nnTF
780     { \l__zrefcheck_integer_bool }
781     {
782       \int_compare_p:nNn
783         { \int_abs:n { \l__zrefcheck_lbl_int - \l__zrefcheck_ref_int } } > { 1 } &&
784         ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 } &&
785         ! \int_compare_p:nNn { \l__zrefcheck_ref_int } = { 0 }
786     }
787     { \group_insert_after:N \prg_return_true: }
788     { \group_insert_after:N \prg_return_false: }
789   \group_end:
790 }
791 \prg_new_protected_conditional:Npnn \__zrefcheck_check_facing:nn #1#2 { F }
792 {
793   \group_begin:
794   \bool_set_true:N \l__zrefcheck_integer_bool
795   \zrefcheck_get_asint:nnn {#1} { abspage } { \l__zrefcheck_lbl_int }
796   \zrefcheck_get_asint:nnn {#2} { abspage } { \l__zrefcheck_ref_int }
797   \bool_lazy_and:nnTF
798     { \l__zrefcheck_integer_bool }
799     {

```

There exists no “facing” page if the document is not twoside.

```

800       \legacy_if_p:n { @twoside } &&

```

Now we test “facing”.

```

801     (
802       (
803         \int_if_odd_p:n { \l__zrefcheck_ref_int } &&
804         \int_compare_p:nNn
805           { \l__zrefcheck_lbl_int } = { \l__zrefcheck_ref_int - 1 }
806       ) ||
807       (
808         \int_if_even_p:n { \l__zrefcheck_ref_int } &&
809         \int_compare_p:nNn
810           { \l__zrefcheck_lbl_int } = { \l__zrefcheck_ref_int + 1 }
811       )
812     ) &&
813     ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 } &&
814     ! \int_compare_p:nNn { \l__zrefcheck_ref_int } = { 0 }
815   }
816   { \group_insert_after:N \prg_return_true: }
817   { \group_insert_after:N \prg_return_false: }
818   \group_end:
819 }

```

(End definition for \\_\_zrefcheck\_check\_nextpage:nn and others.)

### 6.4.5 Close / Far

```

\__zrefcheck_check_close:nn
\__zrefcheck_check_far:nn
820 \prg_new_protected_conditional:Npnn \__zrefcheck_check_close:nn #1#2 { F , TF }
821 {
822   \group_begin:
823     \bool_set_true:N \l__zrefcheck_integer_bool
824     \zrefcheck_get_asint:nnn {#1} { abspage } { \l__zrefcheck_lbl_int }
825     \zrefcheck_get_asint:nnn {#2} { abspage } { \l__zrefcheck_ref_int }
826     \bool_lazy_and:nnTF
827       { \l__zrefcheck_integer_bool }
828       {
829         \int_compare_p:nNn
830           { \int_abs:n { \l__zrefcheck_lbl_int - \l__zrefcheck_ref_int } }
831           <
832           { \l__zrefcheck_close_range_int + 1 } &&
833           ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 } &&
834           ! \int_compare_p:nNn { \l__zrefcheck_ref_int } = { 0 }
835       }
836       { \group_insert_after:N \prg_return_true: }
837       { \group_insert_after:N \prg_return_false: }
838   \group_end:
839 }
840 \prg_new_protected_conditional:Npnn \__zrefcheck_check_far:nn #1#2 { F }
841 {
842   \__zrefcheck_check_close:nnTF {#1} {#2}
843   { \prg_return_false: }
844   { \prg_return_true: }
845 }

```

(End definition for \\_\_zrefcheck\_check\_close:nn and \\_\_zrefcheck\_check\_far:nn.)

### 6.4.6 Chapter

```

\__zrefcheck_check_thischap:nn
\__zrefcheck_check_nextchap:nn
\__zrefcheck_check_prevchap:nn
\__zrefcheck_check_chapsafter:nn
\__zrefcheck_check_chapsbefore:nn
846 \prg_new_protected_conditional:Npnn \__zrefcheck_check_thischap:nn #1#2 { F }
847 {
848   \group_begin:
849     \bool_set_true:N \l__zrefcheck_integer_bool
850     \zrefcheck_get_asint:nnn {#1} { zc@abschap } { \l__zrefcheck_lbl_int }
851     \zrefcheck_get_asint:nnn {#2} { zc@abschap } { \l__zrefcheck_ref_int }
852     \bool_lazy_and:nnTF
853       { \l__zrefcheck_integer_bool }
854       {
855         \int_compare_p:nNn
856           { \l__zrefcheck_lbl_int } = { \l__zrefcheck_ref_int } &&

```

‘0’ is the default value of `zc@abschap` property, and means here no `\chapter` has yet been issued, therefore it cannot be “this chapter”, nor “the next chapter”, nor “the previous chapter”, it is just “no chapter”. Note, however, that a statement about a “future” chapter does not require the “current” one to exist. This comment extends to all chapter checks.

```

857       ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 } &&
858       ! \int_compare_p:nNn { \l__zrefcheck_ref_int } = { 0 }

```

```

859     }
860     { \group_insert_after:N \prg_return_true: }
861     { \group_insert_after:N \prg_return_false: }
862   \group_end:
863 }
864 \prg_new_protected_conditional:Npnn \__zrefcheck_check_nextchap:nn #1#2 { F }
865 {
866   \group_begin:
867     \bool_set_true:N \l__zrefcheck_integer_bool
868     \zrefcheck_get_asint:nnn {#1} { zc@abschap } { \l__zrefcheck_lbl_int }
869     \zrefcheck_get_asint:nnn {#2} { zc@abschap } { \l__zrefcheck_ref_int }
870     \bool_lazy_and:nnTF
871       { \l__zrefcheck_integer_bool }
872       {
873         \int_compare_p:nNn
874           { \l__zrefcheck_lbl_int } = { \l__zrefcheck_ref_int + 1 } &&
875           ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 }
876       }
877     { \group_insert_after:N \prg_return_true: }
878     { \group_insert_after:N \prg_return_false: }
879   \group_end:
880 }
881 \prg_new_protected_conditional:Npnn \__zrefcheck_check_prevchap:nn #1#2 { F }
882 {
883   \group_begin:
884     \bool_set_true:N \l__zrefcheck_integer_bool
885     \zrefcheck_get_asint:nnn {#1} { zc@abschap } { \l__zrefcheck_lbl_int }
886     \zrefcheck_get_asint:nnn {#2} { zc@abschap } { \l__zrefcheck_ref_int }
887     \bool_lazy_and:nnTF
888       { \l__zrefcheck_integer_bool }
889       {
890         \int_compare_p:nNn
891           { \l__zrefcheck_lbl_int } = { \l__zrefcheck_ref_int - 1 } &&
892           ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 } &&
893           ! \int_compare_p:nNn { \l__zrefcheck_ref_int } = { 0 }
894       }
895     { \group_insert_after:N \prg_return_true: }
896     { \group_insert_after:N \prg_return_false: }
897   \group_end:
898 }
899 \prg_new_protected_conditional:Npnn \__zrefcheck_check_chapsafter:nn #1#2 { F }
900 {
901   \group_begin:
902     \bool_set_true:N \l__zrefcheck_integer_bool
903     \zrefcheck_get_asint:nnn {#1} { zc@abschap } { \l__zrefcheck_lbl_int }
904     \zrefcheck_get_asint:nnn {#2} { zc@abschap } { \l__zrefcheck_ref_int }
905     \bool_lazy_and:nnTF
906       { \l__zrefcheck_integer_bool }
907       {
908         \int_compare_p:nNn
909           { \l__zrefcheck_lbl_int } > { \l__zrefcheck_ref_int } &&
910           ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 }
911       }
912     { \group_insert_after:N \prg_return_true: }

```

```

913         { \group_insert_after:N \prg_return_false: }
914     \group_end:
915 }
916 \prg_new_protected_conditional:Npnn \__zrefcheck_check_chapsbefore:nn #1#2 { F }
917 {
918     \group_begin:
919     \bool_set_true:N \l__zrefcheck_integer_bool
920     \zrefcheck_get_asint:nnn {#1} { zc@abschap } { \l__zrefcheck_lbl_int }
921     \zrefcheck_get_asint:nnn {#2} { zc@abschap } { \l__zrefcheck_ref_int }
922     \bool_lazy_and:nnTF
923     { \l__zrefcheck_integer_bool }
924     {
925         \int_compare_p:nNn
926         { \l__zrefcheck_lbl_int } < { \l__zrefcheck_ref_int } &&
927         ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 } &&
928         ! \int_compare_p:nNn { \l__zrefcheck_ref_int } = { 0 }
929     }
930     { \group_insert_after:N \prg_return_true: }
931     { \group_insert_after:N \prg_return_false: }
932 \group_end:
933 }

```

(End definition for \\_\_zrefcheck\_check\_thischap:nn and others.)

#### 6.4.7 Section

```

\__zrefcheck_check_thissec:nn
\__zrefcheck_check_nextsec:nn
\__zrefcheck_check_prevsec:nn
\__zrefcheck_check_secsofter:nn
\__zrefcheck_check_secsofter:nn
934 \prg_new_protected_conditional:Npnn \__zrefcheck_check_thissec:nn #1#2 { F }
935 {
936     \group_begin:
937     \bool_set_true:N \l__zrefcheck_integer_bool
938     \zrefcheck_get_asint:nnn {#1} { zc@abssec } { \l__zrefcheck_lbl_int }
939     \zrefcheck_get_asint:nnn {#2} { zc@abssec } { \l__zrefcheck_ref_int }
940     \zrefcheck_get_asint:nnn {#1} { zc@abschap } { \l__zrefcheck_lbl_b_int }
941     \zrefcheck_get_asint:nnn {#2} { zc@abschap } { \l__zrefcheck_ref_b_int }
942     \bool_lazy_and:nnTF
943     { \l__zrefcheck_integer_bool }
944     {
945         \int_compare_p:nNn
946         { \l__zrefcheck_lbl_b_int } = { \l__zrefcheck_ref_b_int } &&
947         \int_compare_p:nNn
948         { \l__zrefcheck_lbl_int } = { \l__zrefcheck_ref_int } &&

```

‘0’ is the default value of zc@abssec property, and means here no \section has yet been issued since its counter has been reset, which occurs at the beginning of the document and at every chapter. Hence, as is the case for chapters, ‘0’ is just “not a section”. The same observation about the need of the “current” section to exist to be able to refer to a “future” one also holds. This comment extends to all section checks.

```

949         ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 } &&
950         ! \int_compare_p:nNn { \l__zrefcheck_ref_int } = { 0 }
951     }
952     { \group_insert_after:N \prg_return_true: }
953     { \group_insert_after:N \prg_return_false: }
954 \group_end:

```

```

955 }
956 \prg_new_protected_conditional:Npnn \__zrefcheck_check_nextsec:nn #1#2 { F }
957 {
958   \group_begin:
959     \bool_set_true:N \l__zrefcheck_integer_bool
960     \zrefcheck_get_asint:nnn {#1} { zc@abssec } { \l__zrefcheck_lbl_int }
961     \zrefcheck_get_asint:nnn {#2} { zc@abssec } { \l__zrefcheck_ref_int }
962     \zrefcheck_get_asint:nnn {#1} { zc@abschap } { \l__zrefcheck_lbl_b_int }
963     \zrefcheck_get_asint:nnn {#2} { zc@abschap } { \l__zrefcheck_ref_b_int }
964     \bool_lazy_and:nnTF
965       { \l__zrefcheck_integer_bool }
966       {
967         \int_compare_p:nNn
968           { \l__zrefcheck_lbl_b_int } = { \l__zrefcheck_ref_b_int } &&
969         \int_compare_p:nNn
970           { \l__zrefcheck_lbl_int } = { \l__zrefcheck_ref_int + 1 } &&
971         ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 }
972       }
973     { \group_insert_after:N \prg_return_true: }
974     { \group_insert_after:N \prg_return_false: }
975   \group_end:
976 }
977 \prg_new_protected_conditional:Npnn \__zrefcheck_check_prevsec:nn #1#2 { F }
978 {
979   \group_begin:
980     \bool_set_true:N \l__zrefcheck_integer_bool
981     \zrefcheck_get_asint:nnn {#1} { zc@abssec } { \l__zrefcheck_lbl_int }
982     \zrefcheck_get_asint:nnn {#2} { zc@abssec } { \l__zrefcheck_ref_int }
983     \zrefcheck_get_asint:nnn {#1} { zc@abschap } { \l__zrefcheck_lbl_b_int }
984     \zrefcheck_get_asint:nnn {#2} { zc@abschap } { \l__zrefcheck_ref_b_int }
985     \bool_lazy_and:nnTF
986       { \l__zrefcheck_integer_bool }
987       {
988         \int_compare_p:nNn
989           { \l__zrefcheck_lbl_b_int } = { \l__zrefcheck_ref_b_int } &&
990         \int_compare_p:nNn
991           { \l__zrefcheck_lbl_int } = { \l__zrefcheck_ref_int - 1 } &&
992         ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 } &&
993         ! \int_compare_p:nNn { \l__zrefcheck_ref_int } = { 0 }
994       }
995     { \group_insert_after:N \prg_return_true: }
996     { \group_insert_after:N \prg_return_false: }
997   \group_end:
998 }
999 \prg_new_protected_conditional:Npnn \__zrefcheck_check_secsafter:nn #1#2 { F }
1000 {
1001   \group_begin:
1002     \bool_set_true:N \l__zrefcheck_integer_bool
1003     \zrefcheck_get_asint:nnn {#1} { zc@abssec } { \l__zrefcheck_lbl_int }
1004     \zrefcheck_get_asint:nnn {#2} { zc@abssec } { \l__zrefcheck_ref_int }
1005     \zrefcheck_get_asint:nnn {#1} { zc@abschap } { \l__zrefcheck_lbl_b_int }
1006     \zrefcheck_get_asint:nnn {#2} { zc@abschap } { \l__zrefcheck_ref_b_int }
1007     \bool_lazy_and:nnTF
1008       { \l__zrefcheck_integer_bool }

```

```

1009     {
1010         \int_compare_p:nNn
1011             { \l__zrefcheck_lbl_b_int } = { \l__zrefcheck_ref_b_int } &&
1012         \int_compare_p:nNn
1013             { \l__zrefcheck_lbl_int } > { \l__zrefcheck_ref_int } &&
1014         ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 }
1015     }
1016     { \group_insert_after:N \prg_return_true: }
1017     { \group_insert_after:N \prg_return_false: }
1018 \group_end:
1019 }
1020 \prg_new_protected_conditional:Npnn \__zrefcheck_check_secsbefore:nn #1#2 { F }
1021 {
1022     \group_begin:
1023     \bool_set_true:N \l__zrefcheck_integer_bool
1024     \zrefcheck_get_asint:nnn {#1} { zc@abssec } { \l__zrefcheck_lbl_int }
1025     \zrefcheck_get_asint:nnn {#2} { zc@abssec } { \l__zrefcheck_ref_int }
1026     \zrefcheck_get_asint:nnn {#1} { zc@abschap } { \l__zrefcheck_lbl_b_int }
1027     \zrefcheck_get_asint:nnn {#2} { zc@abschap } { \l__zrefcheck_ref_b_int }
1028     \bool_lazy_and:nnTF
1029         { \l__zrefcheck_integer_bool }
1030     {
1031         \int_compare_p:nNn
1032             { \l__zrefcheck_lbl_b_int } = { \l__zrefcheck_ref_b_int } &&
1033         \int_compare_p:nNn
1034             { \l__zrefcheck_lbl_int } < { \l__zrefcheck_ref_int } &&
1035         ! \int_compare_p:nNn { \l__zrefcheck_lbl_int } = { 0 } &&
1036         ! \int_compare_p:nNn { \l__zrefcheck_ref_int } = { 0 }
1037     }
1038     { \group_insert_after:N \prg_return_true: }
1039     { \group_insert_after:N \prg_return_false: }
1040 \group_end:
1041 }

```

(End definition for `\__zrefcheck_check_thissec:nn` and others.)

## 7 zref-clever integration

There are four tasks zref-clever needs to do, in order to offer integration with zref-check from the options of `\zceref`: i) set the “beg label”; ii) set the checks options; iii) run the checks; iv) (possibly) set the “end label”. Since ‘ii)’ can be done directly by running `\keys_set:nn { zref-check / zcheck }` on the options received, we provide convenience functions for the other three tasks.

```

\zrefcheck_zceref_beg_label:
    \zrefcheck_zceref_end_label_maybe:
    \zrefcheck_zceref_run_checks_on_labels:n
1042 \cs_new_protected:Npn \zrefcheck_zceref_beg_label:
1043 {
1044     \int_gincr:N \g__zrefcheck_id_int
1045     \tl_set:Nx \l__zrefcheck_checkbeg_tl
1046         { \__zrefcheck_check_lblfmt:n { \g__zrefcheck_id_int } }
1047     \zref@labelbylist { \l__zrefcheck_checkbeg_tl } { zrefcheck-check }
1048 }
1049 \cs_new_protected:Npn \zrefcheck_zceref_end_label_maybe:

```

```

1050 {
1051   \bool_if:NT \l__zrefcheck_zcheck_end_label_bool
1052   {
1053     \zref@labelbylist
1054     { \__zrefcheck_end_lblfmt:n { \l__zrefcheck_checkbeg_tl } }
1055     { zrefcheck-end }
1056   }
1057 }
1058 \cs_new_protected:Npn \zrefcheck_zcref_run_checks_on_labels:n #1
1059 {
1060   \__zrefcheck_run_checks:nnx
1061   { \l__zrefcheck_zcheck_checks_seq } {#1} { \l__zrefcheck_checkbeg_tl }
1062 }

```

(End definition for `\zrefcheck_zcref_beg_label:`, `\zrefcheck_zcref_end_label_maybe:`, and `\zrefcheck_zcref_run_checks_on_labels:n`. These functions are documented on page ??.)

## 8 zref-vario integration

```

\zrefcheck_zrefvario_label:
\zrefcheck_zrefvario_run_check_on_label:n
1063 \cs_new_protected:Npn \zrefcheck_zrefvario_label:
1064 {
1065   \int_gincr:N \g__zrefcheck_id_int
1066   \tl_set:Nx \l__zrefcheck_checkbeg_tl
1067   { \__zrefcheck_check_lblfmt:n { \g__zrefcheck_id_int } }
1068   \zref@labelbylist { \l__zrefcheck_checkbeg_tl } { zrefcheck-zrefvario }
1069 }
1070 \cs_new_protected:Npn \zrefcheck_zrefvario_run_check_on_label:nn #1#2
1071 { \__zrefcheck_do_check:nnV {#1} {#2} \l__zrefcheck_checkbeg_tl }
1072 \cs_generate_variant:Nn \zrefcheck_zrefvario_run_check_on_label:nn { Vn }

```

(End definition for `\zrefcheck_zrefvario_label:` and `\zrefcheck_zrefvario_run_check_on_label:n`. These functions are documented on page ??.)

```

1073 \</package>

```

## Index

The italic numbers denote the pages where the corresponding entry is described, numbers underlined point to the definition, all others indicate the places where it is used.

Symbols	
<code>\</code>	<u>74</u> , <u>105</u>
A	
<code>\A</code>	<u>120</u>
<code>\AddToHook</code>	<u>21</u> , <u>28</u> , <u>147</u> , <u>205</u>
B	
<code>\begingroup</code>	<u>314</u>
bool commands:	
<code>\bool_if:N</code>	<u>151</u> , <u>155</u> , <u>298</u> , <u>406</u> , <u>596</u> , <u>1051</u>
<code>\bool_if:nTF</code>	<u>393</u> , <u>598</u>
<code>\bool_lazy_and:nnTF</code>	<u>13</u> , <u>273</u> , <u>629</u> , <u>655</u> , <u>705</u> , <u>723</u> , <u>741</u> , <u>760</u> , <u>779</u> , <u>797</u> , <u>826</u> , <u>852</u> , <u>870</u> , <u>887</u> , <u>905</u> , <u>922</u> , <u>942</u> , <u>964</u> , <u>985</u> , <u>1007</u> , <u>1028</u>
<code>\bool_new:N</code>	<u>124</u> , <u>125</u> , <u>210</u> , <u>352</u> , <u>378</u> , <u>453</u> , <u>507</u> , <u>508</u>
<code>\bool_set:Nn</code>	<u>389</u>
<code>\bool_set_false:N</code>	<u>132</u> , <u>141</u> , <u>142</u> , <u>157</u> , <u>216</u> , <u>225</u> , <u>232</u> , <u>288</u> , <u>300</u> , <u>362</u> , <u>521</u> , <u>527</u> , <u>540</u> , <u>547</u> , <u>556</u> , <u>561</u>





<code>\let</code> . . . . .	315	seq commands:	
<b>M</b>		<code>\seq_const_from_clist:Nn</code> . . .	439, 509
<code>\MessageBreak</code> . . . . .	10	<code>\seq_get:NN</code> . . . . .	388
msg commands:		<code>\seq_if_in:NnTF</code> . . . . .	490, 564
<code>\msg_line_context:</code> . . . . .	60,	<code>\seq_map_function:NN</code> . . . . .	412
62, 64, 66, 68, 70, 84, 87, 97, 101		<code>\seq_map_inline:Nn</code> . . . . .	499, 501
<code>\msg_new:nnn</code> . . . . .	59, 61, 63, 65, 67,	<code>\seq_new:N</code> . . . . .	373, 452
69, 71, 76, 78, 83, 85, 90, 95, 100, 102		<code>\seq_put_right:Nn</code> . . . . .	489
<code>\msg_warning:nn</code> . . . . .	156, 162, 202, 257, 276	<code>\seq_set_from_clist:Nn</code> . . . . .	383
<code>\msg_warning:nnn</code> . . . . .	269, 613	<code>\setcounter</code> . . . . .	318
<code>\msg_warning:nnnn</code> . . . . .		sys commands:	
190, 196, 237, 243, 328, 337, 345, 366		<code>\c_sys_jobname_str</code> . . . . .	280
<b>N</b>		<b>T</b>	
<code>\newcounter</code> . . . . .	316	TeX and L <sup>A</sup> T <sub>E</sub> X 2 <sub>ε</sub> commands:	
<code>\NewDocumentCommand</code> . . . . .	277, 371, 417	<code>\@addtoreset</code> . . . . .	315
<code>\NewDocumentEnvironment</code> . . . . .	430	<code>\@currentlabel</code> . . . . .	16
<b>P</b>		<code>\@ifl@t@r</code> . . . . .	3
<code>\PackageError</code> . . . . .	7	<code>\@ifpackageloaded</code> . . . . .	149
<code>\pageref</code> . . . . .	11	<code>\@newl@bel</code> . . . . .	9
prg commands:		<code>\ltx@gobbletwo</code> . . . . .	315
<code>\prg_new_conditional:Npnn</code> . . . . .	108	<code>\zref@addprop</code> . . . . .	17, 27, 31
<code>\prg_new_protected_conditional:Npnn</code>		<code>\zref@addprops</code> . . . . .	33, 41, 48
. . . . .	16, 118, 623, 641,	<code>\zref@extractdefault</code> . . . . .	12, 342, 605, 610
647, 669, 679, 689, 699, 717, 735,		<code>\zref@ifpropundefined</code> . . . . .	336
754, 773, 791, 820, 840, 846, 864,		<code>\zref@ifrefcontainsprop</code> . . . . .	339
881, 899, 916, 934, 956, 977, 999, 1020		<code>\zref@ifrefundefined</code> . . . . .	13, 333, 363,
<code>\prg_return_false:</code> . . . . .	17,	390, 515, 530, 534, 550, 569, 571, 583	
111, 115, 122, 638, 644, 664, 666,		<code>\ZREF@label</code> . . . . .	11
674, 677, 686, 696, 714, 732, 750,		<code>\zref@label</code> . . . . .	11, 421, 433
769, 788, 817, 837, 843, 861, 878,		<code>\zref@labelbylist</code> . . . . .	
896, 913, 931, 953, 974, 996, 1017, 1039		. . . . .	387, 408, 426, 437, 1047, 1053, 1068
<code>\prg_return_true:</code> . . . . .	17,	<code>\ZREF@mainlist</code> . . . . .	27, 31
114, 121, 637, 645, 663, 675, 682,		<code>\zref@newlabel</code> . . . . .	9–11, 293
685, 692, 695, 713, 731, 749, 768,		<code>\zref@newlist</code> . . . . .	32, 40, 47
787, 816, 836, 844, 860, 877, 895,		<code>\zref@newprop</code> . . . . .	17, 26, 30
912, 930, 952, 973, 995, 1016, 1038		<code>\zref@refused</code> . . . . .	13, 412
prop commands:		<code>\zref@require@unique</code> . . . . .	12
<code>\prop_get:NnNTF</code> . . . . .	326	<code>\zref@wrapper@babel</code> . . . . .	
<code>\prop_gput:Nnn</code> . . . . .	302	. . . . .	10, 15, 372, 421, 425, 433, 436
<code>\prop_new:N</code> . . . . .	279	tl commands:	
<code>\providecommand</code> . . . . .	3	<code>\c_empty_tl</code> . . . . .	12, 342
<code>\ProvidesExplPackage</code> . . . . .	14	<code>\tl_clear:N</code> . . . . .	12, 286, 287, 323
<b>R</b>		<code>\tl_gset:Nn</code> . . . . .	280
<code>\refstepcounter</code> . . . . .	12, 16, 420, 432	<code>\tl_if_blank:nTF</code> . . . . .	4
regex commands:		<code>\tl_if_empty:nTF</code> . . . . .	4, 110, 113, 423, 518
<code>\regex_match:nnTF</code> . . . . .	120	<code>\tl_if_empty_p:N</code> . . . . .	275
<code>\RequirePackage</code> . . . . .	16, 17, 18, 152	<code>\tl_if_eq:NnTF</code> . . . . .	293
<code>\romannumeral</code> . . . . .	4, 5	<code>\tl_if_eq:nnTF</code> . . . . .	324
<b>S</b>		<code>\tl_if_exist_p:N</code> . . . . .	274
<code>\section</code> . . . . .	28	<code>\tl_map_break:</code> . . . . .	306
		<code>\tl_map_variable:NNn</code> . . . . .	291
		<code>\tl_new:N</code> . . . . .	165, 353, 375, 376, 377

\tl_set:Nn	170, 172, 174, 178, 179, 184, 185, 341, 385, 1045, 1066
\g_tmpa_tl	280, 281, 283
\l_tmpa_tl	286, 289, 291
\l_tmpb_tl	287, 291, 293, 303
<b>U</b>	
use commands:	
\use:N	55, 525, 538, 545, 554, 558
<b>Z</b>	
\Z	120
\zcheck	14, 15, 17, 371
\zcref	30
zcregion	430
\zctarget	16, 417
\zref	15
zrefcheck commands:	
\zrefcheck_get_asint:nnn	13, 14, 17, 354, 627, 628, 653, 654, 703, 704, 721, 722, 739, 740, 758, 759, 777, 778, 795, 796, 824, 825, 850, 851, 868, 869, 885, 886, 903, 904, 920, 921, 938, 939, 940, 941, 960, 961, 962, 963, 981, 982, 983, 984, 1003, 1004, 1005, 1006, 1024, 1025, 1026, 1027
\zrefcheck_get_astl:nnn	12, 13, 17, 321, 356, 399
\zrefcheck_zcref_beg_label:	1042
\zrefcheck_zcref_end_label_maybe:	1042
\zrefcheck_zcref_run_checks_on_labels:n	1042
\zrefcheck_zrefvario_label:	1063
\zrefcheck_zrefvario_run_check_on_label:n	1063
\zrefcheck_zrefvario_run_check_on_label:nn	1070, 1072
zrefcheck internal commands:	
\g__zrefcheck_abschap_int	19, 23, 26
\g__zrefcheck_abssec_int	19, 24, 29, 30
\g__zrefcheck_auxfile_lblseq_prop	12, 17, 279, 302, 326
\__zrefcheck_check_⟨check⟩:nn	16
\__zrefcheck_check_above:nn	647
\__zrefcheck_check_above:nnTF	673, 684
\__zrefcheck_check_after:nn	679
\__zrefcheck_check_before:nn	679
\__zrefcheck_check_below:nn	647
\__zrefcheck_check_below:nnTF	694
\__zrefcheck_check_chapsafter:nn	846
\__zrefcheck_check_chapsbefore:nn	846
\__zrefcheck_check_close:nn	820
\__zrefcheck_check_close:nnTF	842
\__zrefcheck_check_facing:nn	699
\__zrefcheck_check_far:nn	820
\__zrefcheck_check_lblfmt:n	12, 319, 386, 1046, 1067
\__zrefcheck_check_nextchap:nn	846
\__zrefcheck_check_nextpage:nn	699
\__zrefcheck_check_nextsec:nn	934
\__zrefcheck_check_otherpage:nn	623
\__zrefcheck_check_pagegap:nn	699
\__zrefcheck_check_pagesafter:nn	699
\__zrefcheck_check_pagesafter:nnTF	691, 772
\__zrefcheck_check_pagesbefore:nn	699
\__zrefcheck_check_pagesbefore:nnTF	681, 753
\__zrefcheck_check_ppafter:nn	699
\__zrefcheck_check_ppafter:nnTF	772
\__zrefcheck_check_ppbefore:nn	699
\__zrefcheck_check_ppbefore:nnTF	753
\__zrefcheck_check_prevchap:nn	846
\__zrefcheck_check_prevpage:nn	699
\__zrefcheck_check_prevsec:nn	934
\__zrefcheck_check_secsafter:nn	934
\__zrefcheck_check_secsbefore:nn	934
\__zrefcheck_check_thischap:nn	846
\__zrefcheck_check_thispage:nn	623
\__zrefcheck_check_thispage:nnTF	566, 574, 580, 586, 589, 643, 650, 671
\__zrefcheck_check_thissec:nn	934
\l__zrefcheck_checkbeg_tl	373, 385, 387, 409, 414, 1045, 1047, 1054, 1061, 1066, 1068, 1071
\l__zrefcheck_close_range_int	249, 832
\__zrefcheck_do_check:nnn	19, 502, 512, 1071
\l__zrefcheck_end_label_required_bool	452
\__zrefcheck_end_lblfmt:n	12, 320, 409, 426, 437, 530, 534, 539, 546, 550, 555, 559, 560, 569, 571, 575, 581, 583, 587, 590, 591, 1054
\__zrefcheck_get_asint:nnn	12
\__zrefcheck_get_astl:nnn	12
\g__zrefcheck_id_int	373, 384, 386, 1044, 1046, 1065, 1067
\__zrefcheck_int_to_roman:w	107
\l__zrefcheck_integer_bool	13, 352, 362, 626, 630, 652,

656, 702, 706, 720, 724, 738, 742,	\l__zrefcheck_passedcheck_bool . .
757, 761, 776, 780, 794, 798, 823,	507, 520, 527, 540, 547, 556, 561, 596
827, 849, 853, 867, 871, 884, 888,	\l__zrefcheck_propval_tl . . . . .
902, 906, 919, 923, 937, 943, 959,	. . . . . 353, 356, 357, 359
965, 980, 986, 1002, 1008, 1023, 1029	\l__zrefcheck_ref_b_int . . . . .
\__zrefcheck_is_integer:n . . . 5, 107	. . . . . 619, 941, 946, 963,
\__zrefcheck_is_integer:nTF . . . 357	968, 984, 989, 1006, 1011, 1027, 1032
\__zrefcheck_is_integer_rgx:n 5, 118	\l__zrefcheck_ref_int . . . . . 619,
\__zrefcheck_is_integer_rgx:nTF 254	628, 633, 635, 654, 659, 661, 704,
\l__zrefcheck_lbl_b_int . . . . .	709, 711, 722, 727, 729, 740, 745,
. . . . . 619, 940, 946, 962,	747, 759, 764, 766, 778, 783, 785,
968, 983, 989, 1005, 1011, 1026, 1032	796, 803, 805, 808, 810, 814, 825,
\l__zrefcheck_lbl_int 619, 627, 633,	830, 834, 851, 856, 858, 869, 874,
634, 653, 659, 660, 703, 709, 710,	886, 891, 893, 904, 909, 921, 926,
721, 727, 728, 739, 745, 746, 758,	928, 939, 948, 950, 961, 970, 982,
764, 765, 777, 783, 784, 795, 805,	991, 993, 1004, 1013, 1025, 1034, 1036
810, 813, 824, 830, 833, 850, 856,	\__zrefcheck_run_checks:nnn . . . .
857, 868, 874, 875, 885, 891, 892,	. . . . . 18, 413, 496, 1060
903, 909, 910, 920, 926, 927, 938,	\c__zrefcheck_single_label_-
948, 949, 960, 970, 971, 981, 991,	checks_seq . . . . . 17, 439, 490
992, 1003, 1013, 1014, 1024, 1034, 1035	\l__zrefcheck_use_hyperref_bool .
\l__zrefcheck_link_anchor_tl . . .	. . . . . 124, 151, 157, 395
. . . . . 373, 401, 402	\l__zrefcheck_warn_hyperref_bool
\l__zrefcheck_link_label_tl . . . .	. . . . . 124, 155
. . . . . 373, 388, 390, 400	\__zrefcheck_zcheck:nnnn 15, 372, 379
\l__zrefcheck_link_star_bool . . .	\__zrefcheck_zcheck:nnnnn 13, 14, 19
. . . . . 373, 389, 396	\l__zrefcheck_zcheck_checks_seq .
\__zrefcheck_message:nnnn 53, 604, 609	. . . . . 413, 452, 489, 1061
\l__zrefcheck_msglevel_tl . . . 55, 165	\l__zrefcheck_zcheck_end_label_-
\l__zrefcheck_msgonpage_bool 210, 600	bool . . . . . 406, 453, 491, 1051
\l__zrefcheck_onpage_bool . . . . .	\l__zrefcheck_zcheck_labels_seq .
507, 521, 568, 576, 582, 588, 592, 601	. . . . . 373, 383, 388, 412, 414
\c__zrefcheck_onpage_checks_seq .	\zrefchecksetup . . . . . 9, 277
. . . . . 507, 564	