

The `lastpage` package

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Abstract

This L^AT_EX package puts the label `LastPage` at the end of the document into the `.aux` file, allowing the user to refer to the last page of a document. This might be particularly useful in places like headers or footers. –

While this package allows for things like

“Page `\thepage{}` of `\pageref{LastPage}`” to get “Page 7 of 9” or “Page VII of IX”, the *number* of pages is nowadays available from the kernel (`\@abspage@last`, `\thetotalpages`, `\PreviousTotalPages`), but when more than one page numbering scheme is used (for example pages I to X and then 1 to 10, thus number of pages “20”, but name of the last page “10”), or another package has output after this package, or the page numbers exceed a certain range, there might be problems, which can be solved by using the `pageslts` package instead.

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Note: At several places in this manual as alternative the `pageslts` package is “advertised”. The current version 2015/12/21 v1.2f of that package has not yet been updated to the new hook mechanism. In special cases (for example `\pagenumbering{fnsymbol}`) the current version of that package combined with a current L^AT_EX-format fails. Together with a lot of other packages (small to large, public as well as private, some probably obsolete) it is in my update queue.

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1 Introduction

This L^AT_EX package puts the label `LastPage` (at end of the document) into the `aux` file, allowing the user to refer to the last page of a document via `\pageref{LastPage}`. This might be particularly useful in places like headers or footers.

This package was invented by **Jeffrey P. Goldberg**, and is now maintained by H.-MARTIN MÜNCH. A big “Thank you!” to JEFFREY P. GOLDBERG for granting this.

If you are more ambitious in respect to your aims with this package, you might want to have a look at the `pageslts` package (see section 4: Alternatives).

2 Usage

Just load the package placing

```
\usepackage{lastpage}
```

in the preamble of your source file (or `\input{lastpage.sty}` if `\usepackage` is unknown).

For example for various draft forms it is desirable to have a page reference to the last page, so that e.g. page footers can contain something like “page N of K ”, where N is the current page and K is the last page. Once the package is loaded, anywhere in the text references can be made to the label `LastPage`. In particular one can use the `fancyhdr` or `nccfancyhdr` package, or redefinitions of the page headings and footings to get a reference to the last page.

In your document the code

```
\makeatletter
\renewcommand{\@evenfoot}{%
  \normalsize\slshape DRAFT \today\hfil \upshape %
  page \thepage{} of \pageref{LastPage}}
\renewcommand{\@oddfoot}{\@evenfoot}
\makeatother
```

creates footers like

“*DRAFT July 3, 2024* page 7 of 9”

in the compiled document (cf. the `lastpage-example` file).

If the `hyperref` package is used, the references are hyperlinked to their aims. If these hyperlinks shall be suppressed, `\pageref*{...}` instead of `\pageref{...}` can be used.

The `lastpage` package does not provide the words “page” or “of”, but e.g. the `handout` class uses “of” in the definition of the footer. (In the `lastpage-example` also `\@evenfoot` is redefined, but it is not the `lastpage package` redefining this.) If you want to change “page” or “of” (e.g. to another language), you therefore have got to look in the used class/package(s)/preamble instead of in the `lastpage package`.

If the total *number* of pages of a document is needed, the kernel already gives this by `\makeatletter\@abspage@last\makeatother`, `\thetotalpages`, and `\PreviousTotalPages` (needing at least two compiler runs).

3 Some Warnings

3.1 `\AtEndDocument`

`\AtEndDocument` is not used by the `lastpagemodern.sty` version of the `lastpage` package, requiring `LATEX-format 2023-06-01` or newer. Instead `\AddToHook{enddocument/afterlastpage}` is used and the problem does not arise.

`lastpageclassic.sty` uses `\AtEndDocument` and `lastpage209.sty` redefines `\enddocument`. The last two cases are problematic:

The output of a `LATEX 2ε` run is not independent of the order in which the packages are loaded. It is often the case that the same formats for which one must put tables and figure at the end, are the ones in which endnotes are also required. If one wants to use `\AtEndDocument` here as well (as done for `\pageref{LastPage}`), then it is easy to get to three separate uses of `\AtEndDocument` (assuming one uses this for the endnotes as well). Clearly it is not safe for any package writer or user to assume that no material will follow what they put into `\AtEndDocument`. Therefore a message, which begins with `AED`, is included in every usage of `\AtEndDocument`. `lastpage` uses `\AtEndDocument{... \clearpage...}`, thus

`\usepackage{lastpage}... \AtEndDocument{something}` will place *something* after the `\clearpage`. To place it earlier, use

`\AtEndDocument{something}... \usepackage{lastpage}`. If the *something* is not known before `\usepackage{lastpage}`, you can use for example

```
...
\def\beforeLastpageClearpage{\relax}
\AtEndDocument{\beforeLastpageClearpage}
\usepackage{lastpage}
\begin{document}
...
\def\beforeLastpageClearpage{\textit{something}}%
...
\end{document}
```

(might need a protected and/or expanded `\def`). When `\clearpage` leads to some output, `\clearpage\textit{something}` instead of `\textit{something}` might be wanted.

3.2 Interaction with ancient versions of the `endfloat` package

`\AtEndDocument` is not used by the `lastpagemodern.sty` version of the `lastpage` package, requiring `LATEX-format 2023-06-01` or newer. Instead `\AddToHook{enddocument/afterlastpage}` is used and the problem does not arise.

The *ancient* version 2.0 (and earlier; 2.0 from 1992; current version at the time of updating this documentation: 2.7 from 2019) of the `endfloat` package actually redefined the `\enddocument` command, and so interfered drastically with the `LATEX 2ε` commands which make use of `\AtEndDocument`. If you want your `LastPage` to label the last page of these end floats, you need to load `lastpage` after loading `endfloat` (or use `VeryLastPage` from the `pageslts` package instead). If, on the other hand, you *want* `LastPage` to refer to the (not so) last page, exclusive of the floats at the end, then load in the reverse order. Independent from the order of `lastpage` and `endfloat`, you will still need a version of `endfloat` later than 2.0 from 1992.

Other `LATEX 2.09` (!) packages also seem to like to redefine `\enddocument`. In addition to the old `endfloat`, `harvard` comes to mind. All of these will need to be modified swiftly.

3.3 Page name instead of page number

When any page numbering scheme other than `arabic` is used at the page, which `\pageref{LastPage}` refers to, the *name* and not the *number* of the page is given. For example, `Alph` page numbering scheme and 10 pages will give J instead of 10, `Roman` page numbering scheme and 10 pages will give X instead of 10, and so on.

(The `pageslts` package puts `\lastpageref{LastPages}` (with `s` at the end) at your disposal for remediation.)

3.4 No write access to the aux file

Some packages (e.g. `tikz` and `selectp`) sometimes prevent the output to the `aux` file. In that case a warning is issued. This is no problem as long as there is another compilation run where the label to the last page can be placed via the `aux` file.

3.5 Wrong last page number with more than one page numbering scheme

When more than one page numbering scheme is used, `LastPage` does not give the total **number** of pages (even if `arabic` is the page numbering scheme of that page). For example, for a document with VI+36 pages, it gives “36” as reference to the last page. While this is correct, the total number of pages is 42.

If the total *number* of pages of a document is needed, the kernel already gives this by `\makeatletter\@abspage@last\makeatother`, `\thetotalpages`, and `\PreviousTotalPages`. The `pageslts` package puts `\lastpageref{LastPages}` (with `s` at the end) at your disposal for remediation, giving the number of pages and linking to the last page, if linking is provided for example by the `hyperref` package.

3.6 `\addtocounter{page}{...}` and `\setcounter{page}{...}`

When the page number was manipulated by `\addtocounter{page}{...}` or `\setcounter{page}{...}`, `LastPage` does not give the total **number** of pages (even if `arabic` is the page numbering scheme of that page).

The `pageslts` package puts `\lastpageref{LastPages}` (with `s` at the end) at your disposal for remediation: `LastPages` ignores page number manipulation. Also `\@abspage@last`, `\thetotalpages`, and `\PreviousTotalPages` from the kernel are not influenced by page number manipulation.

3.7 Page number reset by `\pagenumbering{...}`

At a page numbering change the page number is reset to one. Therefore `LastPage` does not give the total **number** of pages (even if `arabic` is the page numbering scheme of that page). Furthermore, now two pages have the same name.

The `pageslts` package does not only put `\lastpageref{LastPages}` (with `s` at the end) at your disposal for remediation: `LastPages` also ignores page number manipulation. It furthermore offers the option `pagecontinue` to continue the page numbering, when `\pagenumbering{...}` is used.

3.8 Last pages of different page numbering schemes

`\pageref{LastPage}` refers to the (maybe not so) last page of the last page numbering scheme. References to the respective last page of the other page numbering schemes are not provided.

The `pageslts` package does this with labels `pagesLTS.<numbering scheme>`, where `<numbering scheme>` is e.g. `arabic`, `roman`, `Roman`, `alph`, or `Alph`. For `fnsymbol` please use `\lastpageref{pagesLTS.fnsymbol}` instead of `\pageref{pagesLTS.fnsymbol}`.

3.9 Current page

The command `\thepage` gives the **name** of the current page in the current page numbering scheme, which is different from the current total/absolute page number e.g. with a second page numbering scheme, `\addtocounter{page}{...}`, or `\setcounter{page}{...}`, and it will not be an arabic number at all, if the current page numbering scheme is not arabic.

The `pageslts` package provides the command `\theCurrentPage` and for the current number of pages in the current page numbering scheme

`\theCurrentPageLocal`. The kernel already provides the number of pages, which have been shipped out, as `\the\ReadonlyShipoutCounter`. The current page is always `ReadonlyShipoutCounter + 1`.

3.10 First page

There is no special label at the first page. (This is the `lastpage` package, after all.) The `pageslts` package creates a label `pagesLTS.0` at the first page of the document.

3.11 Page counter overflow

“The ranges of supported counter values are more or less restricted. Only `\arabic` can be used with any counter value T_EX supports.

Presentation command	Supported domain	Ignored values	Error message ‘Counter too large’
<code>\arabic</code>	<code>-MAX..MAX</code>		
<code>\roman</code> , <code>\Roman</code>	<code>1..MAX</code>	<code>-MAX..0</code>	
<code>\alph</code> , <code>\Alph</code>	<code>1..26</code>	<code>0</code>	<code>-MAX..-1</code> , <code>27..MAX</code>
<code>\fnsymbol</code>	<code>1..9</code>	<code>0</code>	<code>-MAX..-1</code> , <code>10..MAX</code>

`MAX = 2147483647`

” (HEIKO OBERDIEK: The `alphalph` package, 2010/04/18, v2.3, first table, p. 2).

When *any* page is out of that range, there will be a counter overflow.

`lastpage` probably is not the right package to be asked to correct this anyway, but the `pageslts` package (with appropriate options) can do this.

3.12 Other packages manipulating `\lastpage@putlabel`

The `revtex4` class redefines the `\lastpage@putlabel` command (with outdated two arguments), and the `pageslts` package “kills” the `\lastpage@putlabel` command, because that package uses more advanced labels.

None of the definitions or commands of the other packages are altered, but `\lastpage@putlabel` was replaced by `\lastpage@putl@bel`. Because `\lastpage@putlabel` is no longer called, now there should not be any double definitions of the `lastpage` label.

3.13 `\pagenumbering{fnsymbol}`

When using the foot-note-symbols as page numbers, it can be necessary to declare in the document’s preamble:

```
\DeclareTextCommand{\textasteriskcentered}{PD1}{*}
\DeclareTextCommand{\textdagger}{PD1}{†}
% \DeclareTextCommand{\textdaggerdbl}{PD1}{‡} % seems to neither work nor be necessary
\DeclareTextCommand{\textsection}{PD1}{§}
\DeclareTextCommand{\textparagraph}{PD1}{¶}
\DeclareTextCommand{\textbardbl}{PD1}{||}
```

4 Alternatives

There are similar packages, which do (or do not) similar things (or even more). As I neither know what exactly you want to accomplish when using this package (e. g. page number vs. page name, hyperlinks or not), nor what resources you have (e. g. \TeX , \LaTeX 2 ϵ , ε - \TeX , \LaTeX -format as recent as 2022-11-01 or newer), here is a list of some possible alternatives:

`pageslts`

- **Note: The current version 2015/12/21 v1.2f of the `pageslts` package has not yet been updated to the new hook mechanism. In special cases (for example `\pagenumbering{fnsymbol}`) the current version of that package combined with a current \LaTeX -format fails. Together with several other packages (small to large, public as well as private, some probably obsolete) it is in the update queue.**

The `pageslts` package first started as a revision of this `lastpage` package, but it became obvious that a replacement was needed to accomplish what the `pageslts` package does. For backward compatibility, a label named `LastPage` is provided. Thus `\usepackage{lastpage}` can be replaced by

```
\usepackage[pagecontinue=false,alphMult=0,AlphMulti=0,
  fnsymbolmult=false,romanMult=false,RomanMulti=false]{pageslts},
```

if the behaviour of the `lastpage` package should be simulated. The default options are

```
\usepackage[pagecontinue=true,alphMult=ab,AlphMulti=AB,
  fnsymbolmult=true,romanMult=true,RomanMulti=true]{pageslts}.
```

Benefits of `pageslts` package (with appropriate options) are:

- + Labels `LastPage` (`\AtEndDocument`) and `VeryLastPage` (`\AfterLastShipout`), allowing the user to refer to the (very) last page of a document.
- + For example, when more than one page numbering scheme is used, the label `LastPages` gives the total *number* of pages.
- + At the last page of each page numbering scheme a label `pagesLTS.<numbering scheme>` is placed, where `<numbering scheme>` is e. g. `arabic`, `roman`, `Roman`, `alph`, or `Alph`. For `fnsymbol` please use `\lastpageref{pagesLTS.fnsymbol}` instead of `\pageref{pagesLTS.fnsymbol}`.
- + When the same numbering scheme is used twice, the page numbers are either reset to one or continued automatically, depending on the option given when the package is called.
- + The command `\theCurrentPage` prints the current total/absolute page number – in contrast to `\thepage`, which gives only the page *name* in the current page numbering scheme. `\theCurrentPageLocal` gives the current number of pages in the current page numbering scheme. `\thepage` and `\theCurrentPageLocal` are different e. g. when `\addtocounter{page}{...}` or `\setcounter{page}{...}` were used.
- + At the first page of the document a label `pagesLTS.0` is created.
- + The `alphalph` package is supported, i. e. page numbers `alph` or `Alph` > 26 and `fnsymbol` > 9 can be used (with according options set). Even zero and negative page numbers can be used with `arabic`, `alph`, `Alph`, `roman`, `Roman`, and `fnsymbol` page numbering (with `alphalph` package and according options).
- + It is checked whether a (very) old `endfloat` package is in use. If it is, a warning or even an error message is given, depending on `endfloat` version.
- + A rerun warning is given, when labels have changed.

Further labels are provided for special cases.

- `totpages` - The `totpages` package provides a `totpages` label similar to `LastPages` `\AtEndDocument` (instead of `\AfterLastShipout`, as done by `pageslts`). The `totpages` package additionally computes the number of paper sheets needed to (double) print the document (with one, two, three,... pages on one sheet of paper) (which can be achieved also with the `papermas` package, an extension of the `pageslts` package, which further allows to compute the mass of that printed version of the document, useful e. g. when sending it by mail to determine the postage).
- `nofm.sty` - “There is a package `nofm.sty` available, but some versions of it are defective, and most don’t work with `fancyhdr` because they take over the complete page layout.” (PIET VAN OOSTRUM: Page layout in L^AT_EX, March 2, 2004, section 16; `fancyhdr.pdf`)
`nofm` as of 1991/02/25 (without version number), available at <https://mirror.ctan.org/obsolete/macros/latex209/contrib/misc/nofm.sty>, does not work with e.g. `hyperref`, redefines `\enddocument` as well as `\@oddhead`, `\@evenhead`, `\@oddfoot`, and `\@evenfoot`.
 If you know the (CTAN) location of a **working** (!) version, please send an e-mail to the `lastpage` maintainer, thanks!
- `countlto` - You may want to have a look at the `countlto` package.
- `totalcount` - The `totalcount` package provides `\totalpages`. If there are only arabic page numbers consecutively running from 1 to the last page, this works. But for example
- ```
\documentclass{article}
\usepackage[page]{totalcount}
\pagenumbering{Roman}
\begin{document}
\addtocounter{page}{49}
Page \thepage{} of \totalpages
\end{document}
```
- prints “Page L of 50”, where the number of pages is one (and no hyperlink is provided to the last page even if `hyperref` is used).
- `zref` - The `zref` package of HEIKO OBERDIEK requires  $\varepsilon$ -T<sub>E</sub>X. `lastpageclassic` does not require  $\varepsilon$ -T<sub>E</sub>X, but if you already have  $\varepsilon$ -T<sub>E</sub>X (and use `lastpagemodern`), you may also have a look at the extensive `zref` package, whether it suits your needs better (or additionally or whatsoever).
- `memoir` - The `memoir class` provides `\thelastpage` (page number printed on last page) and `\thelastsheet` (number of pages).
- `LaTeX-kernel` - The number of pages is nowadays available via `\@abspage@last`, `\thetotalpages`, and `\PreviousTotalPages` from the kernel, but when more than one page numbering scheme is used (for example pages I to X and then 1 to 10, thus number of pages “20”, but name of the last page “10”), or when or the `fn-symbol` page numbering scheme is used, or another package has output after this package, or the page numbers exceed a certain range, there might be issues. (Is the total number of pages wanted? Or is the name of the last page sought?)

(You programmed or found another alternative, which is available at [CTAN.org](https://CTAN.org)? OK, send an e-mail to me with the name, location at [CTAN.org](https://CTAN.org), and a short notice, and I will probably include it in the list above.)

About how to get those packages, please see subsection 7.1.



## 5 Example

```
1 (*example)
2 \documentclass[british]{article}[2024/02/08]% v1.4n Standard LaTeX document class
3 \makeatletter
4 \@ifl@t@r\fmtversion{2022/11/01}{%
5 \AddToHook{enddocument/afterlastpage}[lastpage]{%
6 \message{^^JLaTeX Info: Executing hook 'enddocument/afterlastpage'.}}%
7 }{\AtEndDocument{\message{^^JLaTeX Info: Executing hook 'AtEndDocument'.}}%
8 }
9 \usepackage[draft]{showkeys}[2024/05/23]% v3.21 Show cite and label keys (DPC, MH)
10 %% Use final instead of draft to hide the keys. %%
11 \usepackage[pdfpagelabels=true,hyperindex=false]{hyperref}[2024-01-20]% v7.01h
12 %% Hypertext links for LaTeX
13 \hypersetup{extension=pdf,%
14 plainpages=false,%
15 pdflang={en},%
16 pdftitle={lastpage package example},%
17 pdfauthor={H.-Martin Muench},%
18 pdfsubject={Example for the lastpage package},%
19 pdfkeywords={LaTeX, lastpage},%
20 pdfview=Fit,%
21 pdfstartview=Fit,%
22 pdfpagelayout=SinglePage%
23 }
24 \@ifpackageloaded{hyperref}{\usepackage[url][2013/09/16]}% v3.4
25 \usepackage{lastpage}[2024/07/03]% v2.1b
26 \renewcommand{\@evenfoot}{%
27 \normalsize\slshape \today\hfil \upshape %
28 page \thepage{} of \pageref{LastPage}}
29 \renewcommand{\@oddfoot}{\@evenfoot}
30 \makeatother
31 \listfiles
32 \begin{document}
33 \pagenumbering{Roman}
34 \section*{Example for lastpage}
35 \markboth{Example for lastpage}{Example for lastpage}
36 This example demonstrates the use of package\newline
37 \textsf{lastpage}, v2.1b as of 2024-07-03 (HMM; JPG).\newline
38 The package takes no options.\newline
39 For more details please see the documentation!\newline
40
41 \noindent \label{keys} To hide the \pageref{keys}{\quad } use option
42 \texttt{final} instead of \texttt{draft} with the \textsf{showkeys}
43 package (or remove the package call from the preamble of
44 this document).\newline
45
46 \textbf{Hyperlinks or not:} If the \textsf{hyperref} package is loaded,
47 the references are also hyperlinked:\newline
48 \smallskip
49 Last page's name (LastPage): \pageref{LastPage}\newline
50 \noindent If the \textsf{hyperref} package is loaded, but the hyperlinks
51 of the references shall be suppressed, \verb|\pageref*{...}|
52 can be used:\newline
53 \smallskip
54 Last page's name (LastPage): \pageref*{LastPage}\newline
55
56 \textbf{Trademarks} appear throughout this example without any
57 trademark symbol; they are the property of their respective
58 trademark owner. There is no intention of infringement; the
59 usage is to the benefit of the trademark owner.\newline
60
61 \textbf{Tip}: Use \textit{logical page numbers}
```

```

62 for the display of the pdf (in Adobe Acrobat Reader 2024.002.20895:
63 Edit >> Preferences >> Page Display >>)
64 Page Content and Information: Use logical page numbers!\newline
65
66 If you are more ambitious in respect to your aims with this package,
67 you might want to have a look at the \textsf{pageslts} package:\newline
68 \url{https://ctan.org/pkg/pageslts}.
69 \bigskip
70
71 \noindent The page (\verb|\thepage|): \thepage \newline
72 Last page's name (LastPage): \pageref{LastPage}
73 \newpage
74
75 \noindent The page (\verb|\thepage|): \thepage \newline
76 Last page's name (LastPage): \pageref{LastPage}
77
78 \bigskip
79
80 \noindent There was the question:
81
82 \begin{quote}
83 \begin{verbatim}
84 \documentclass{article}
85 \usepackage{hyperref}
86 \usepackage{lastpage}
87 \begin{document}
88 \ifnum\thepage=\pageref{LastPage} foo \else bar \fi
89 \end{document}
90 \end{verbatim}
91
92 producing the error
93 \textquotedblleft missing number, treated as zero\textquotedblright.
94 \end{quote}
95
96 \noindent \verb|\pageref| inserts a hyperlink, \verb|\pageref{LastPage}|
97 is not expandable and the code breaks.\newline
98 The code does not generally work even without hyperref.
99
100 \begin{quote}
101 \begin{verbatim}
102 \documentclass{article}
103 \usepackage{hyperref}
104 \usepackage{lastpage}
105 \pagenumbering{Roman}
106 \begin{document}
107 \addtocounter{page}{8}
108 \edef\here{\thepage}
109 \makeatletter
110 \ifx\here\lastpage@lastpage\relax foo\else bar\fi
111 \makeatother
112 \end{document}
113 \end{verbatim}
114 \end{quote}
115
116 \noindent does work (two compilations needed), because \verb|\lastpage@lastpage|
117 contains the name of the page, \mbox{example:}
118 \begin{verbatim}
119 Page \thepage{} is (not) page \makeatletter\lastpage@lastpage\makeatother.
120 \end{verbatim}
121 prints:\newline
122 Page \thepage{} is (not) page \makeatletter\lastpage@lastpage\makeatother.
123 \newline

```

```

124 This can be broken for example by \verb|\pagenumbering{fnsymbol}|
125 (because then \verb|\edef\here{\thepage}| does not work).
126 \newpage
127
128 \noindent The page (\verb|\thepage|): \thepage\newline
129 Last page's name (LastPage): \pageref{LastPage}
130 \bigskip
131
132 With modern \LaTeX{} it is possible to say:
133 \begin{quote}
134 \begin{verbatim}
135 \NeedsTeXFormat{LaTeX2e}[2023-11-01]
136 \documentclass{article}
137 \pagenumbering{fnsymbol}
138 \begin{document}
139 \addtocounter{page}{8}%
140 \ExplSyntaxOn%
141 \xdef\test{\numexpr\the\g_shipout_readonly_int +1\relax}%
142 \ExplSyntaxOff%
143 \ifnum\PreviousTotalPages=\test\relax%
144 This is the last page.%
145 \else%
146 This is not the last page
147 (or it is but \LaTeX{} needs another compilation run
148 to detect this).
149 \fi
150 \end{document}
151 \end{verbatim}
152 \end{quote}
153
154 \newpage
155 \section*{The End}
156 \noindent The page (\verb|\thepage|): \thepage \newline
157 Last page's name (LastPage): \pageref{LastPage}
158 \bigskip
159
160 To see the content of the \texttt{enddocument/afterlastpage}-hook
161 (for a recent \LaTeX-format!) use % without the \verb|,|, of course!
162 \verb|\ShowHook{enddocument/afterlastpage}|.
163 \end{document}
164 </example>

```

## 6 The implementation

`lastpage.sty` We first need to determine whether we are on  $\text{T}_{\text{E}}\text{X}$  2.09 or  $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}2_{\text{e}}$ . (That line, which is too long for the documentation, reads:  
`\def\loadlastpage{\ProvidesPackage{lastpage}[2024/07/03 v2.1b lastpage: 2.09 or 2e? (HMM)]\relax\RequirePackage{lastpage2e}}.`)

```
165 (*package)
166 %% Part of the "lastpage" package
167 %% loads either lastpage2.09.sty for TeX 2.09 or lastpage2e.sty for LaTeX 2e
168 %% with code from https://groups.google.com/g/comp.text.tex/c/-Qmhj1ZI4xM
169 \def\loadlastpage{\ProvidesPackage{lastpage}[2024/07/03 v2.1b lastpage: 2.09 or 2e? (HMM)]\relax
170 \begingroup \expandafter \ifx \csname documentclass\endcsname\relax
171 \endgroup \expandafter \input{lastpage209.sty}
172 \else \endgroup \expandafter \loadlastpage
173 \fi
174 </package>
```

`lastpage209.sty` If we are on  $\text{T}_{\text{E}}\text{X}$  2.09 (really?!), we load the 2.09 version `lastpage209.sty`:

```
175 (*lastpage209)
176 %% Part of the "lastpage" package
177 %% FOR LaTeX 2.09 ONLY - FOR LaTeX 2e USE lastpage2e.sty
178 %% This is lastpage209.sty invented by Jeffrey P. Goldberg,
179 %% after Piet van Oostrum: Page layout in LaTeX, March 2, 2004, section 16;
180 %% fancyhdr.pdf; lastpage209.sty maintained by H.-Martin Muench.
181 \let\origenddocument=\enddocument%
182 \def\enddocument{\clearpage%
183 {\addtocounter{page}{-1}%
184 \immediate\write\@mainaux{\string\newlabel{LastPage}{\the page}}%
185 }%
186 \addtocounter{page}{+1}%
187 \origenddocument%
188 }
189 </lastpage209>
```

`lastpage2e.sty` If `\documentclass` is known, we are in  $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}2_{\text{e}}$  – but which one? For modern versions with  $\varepsilon\text{-T}_{\text{E}}\text{X}$  and hook management etc. we load version `lastpagemodern.sty`, otherwise `lastpageclassic.sty`. We start off by checking that we are loading into  $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}2_{\text{e}}$  and announcing the name and version of this package.

```
190 (*lastpage2e)
191 %% Part of the "lastpage" package
192 \NeedsTeXFormat{LaTeX2e}[1994/12/01]
193 \ProvidesPackage{lastpage2e}[2024/07/03 v2.1b %
194 Decide which 2e lastpage version to use (HMM)]
195 \@ifl@t@r\fmtversion{2023/06/01}{\RequirePackage{lastpagemodern}}{%
196 \RequirePackage{lastpageclassic}}
197 \message{^^J}
198 </lastpage2e>
```

`lastpageclassic.sty` In case of older  $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ -formats `lastpageclassic.sty` is loaded:

```
199 (*lastpageclassic)
200 %% Part of the "lastpage" package
201 \NeedsTeXFormat{LaTeX2e}[1994/12/01]
202 \ProvidesPackage{lastpageclassic}[2024/07/03 v2.1b %
203 Refers to last page's name (HMM; JPG)]
204 %% allows for things like "Page \thepage{} of \pageref{LastPage}"
205 %% to get "Page 7 of 9"
206
```

For comparisons, “one” is defined (`\@one` does not work for this).

```
207 \gdef\lastpage@one{1}
```

We define `\lastpage@hyper`, `\lastpage@nameref`, `\lastpage@french`, and `\lastpage@LTS` to be “0”.

```
208 \gdef\lastpage@hyper{0}
209 \gdef\lastpage@nameref{0}
210 \gdef\lastpage@french{0}
211 \gdef\lastpage@LTS{0}
```

We define `\lastpage@firstpage` to be “1”, and before re-definition via the `.aux` file, `\lastpage@lastpage` and `\lastpage@lastpageHy` are unknown.

```
212 \gdef\lastpage@firstpage{1}
213 \gdef\lastpage@lastpage{??}
214 \gdef\lastpage@lastpageHy{??}
215
```

`\AtBeginDocument` `\AtBeginDocument` we give a warning about ancient versions of the `endfloat` package. Then it is checked whether various packages are loaded. (`\@ifpackageloaded` cannot be used later than `\AtBeginDocument`.) If this is the case, `\lastpage@<package abbreviation>` is defined as 1 (otherwise it stays 0).

```
216 \AtBeginDocument{%
217 \@ifpackageloaded{endfloat}{%
218 \ifpackageolder{endfloat}{1993/04/30}{\relax}{%
219 \PackageError{lastpage}{%
220 Incompatibility with outdated version of endfloat package}{%
221 lastpage is not fully compatible with a version\MessageBreak%
222 before 2.1 of the endfloat package,\MessageBreak%
223 because those versions redefined\MessageBreak%
224 the \string\enddocument\space command.}%
225 }{}%
226 \@ifpackageloaded{tikz}{\gdef\lastpage@tikz{1}}{}%
227 \@ifpackageloaded{hyperref}{\gdef\lastpage@hyper{1}}{}%
228 \@ifpackageloaded{nameref}{\gdef\lastpage@nameref{1}}{}%
229 \@ifpackageloaded{french}{\gdef\lastpage@french{1}}{}%
230 \@ifpackageloaded{frenchle}{\gdef\lastpage@french{1}}{}%
231 \@ifpackageloaded{pagesLTS}{\gdef\lastpage@LTS{1}}{}%
232 \@ifpackageloaded{pageslts}{\gdef\lastpage@LTS{1}}{}%
}
```

`\lastpage@putlabel`, used by older versions of this package, is redefined e.g. by `revtex`, `frenchle`, `PPRcorners`, and old versions of `hyperref`. While now `\lastpage@putl@bel` is used instead, `revtex` could also define a label `LastPage`, which then would be multiply defined. (Which is no big issue, if it is associated with the same page.) Therefore we define

```
233 \gdef\lastpage@putlabel{\relax}%
234 }
235
```

Because `\lastpage@putlabel` might be (re)defined later, depending on the order in which the packages are loaded, we will do this again `\AtEndDocument`.

`\lastpage@putl@bel` This command does the writing of the label:

```
236 \newcommand{\lastpage@putl@bel}{%
```

```
 \AtBeginDocument it is checked whether the hyperref package is loaded,
 \@ifpackageloaded{hyperref}{\gdef\lastpage@hyper{1}}{}
 \@ifpackageloaded cannot be used later than \AtBeginDocument.
 User SEBASTIAN BANK found and reported (Thanks!) a case, when this check is
 not sufficient. Using a class with
 \usepackage{lastpage}
 \AtBeginDocument{\usepackage{hyperref}}
 leads to failed detection of the hyperref package, because \AtBeginDocument first
 the check for hyperref is performed, and then hyperref is loaded. As mentioned
 above, \@ifpackageloaded cannot be used later, so here we do not check for
```

the `hyperref` package again, but for its `\Hy@Warning` command. In version 1.2c of the `lastpage` package, it was checked for the `\hyperref` command, but as it turned out, `tcilatex` is defining that. If some other package or user is defining `\Hy@Warning`, `lastpage` will falsely assume, that `hyperref` has been loaded, but in my humble opinion, defining `\Hy@Warning` does not make sense and is bad style (except definition by the `hyperref` package itself, of course).

```
237 \ifundefined{Hy@Warning}{% hyperref not loaded
238 }\gdef\lastpage@hyper{1}% hyperref loaded
239 }%
```

If the `pageslts` package is used, this `lastpage` package is not needed at all. The `LastPage` label would even be defined twice. Thus, if `pageslts` is used, here nothing is done:

```
240 \ifx\lastpage@LTS\lastpage@one%
241 \else%
```

Otherwise the label is set:

We have got to distinguish whether `hyperref` has been loaded or not:

```
242 \ifx\lastpage@hyper\lastpage@one%
243 \lastpage@putlabelhyper%
244 \else%
```

and also need to treat documents with `nameref` differently:

```
245 \ifx\lastpage@nameref\lastpage@one%
246 \lastpage@putlabelNR%
247 \else%
```

When those packages have not been loaded, we just write the simple label into the `aux` file (and store the value of the page):

```
248 \begingroup%
249 \addtocounter{page}{-1}%
250 \immediate\write\@auxout{\string\newlabel{LastPage}{{}\{the\page}}}%
251 \immediate\write\@auxout{\string\xdef\string\lastpage@lastpage{the\page}}%
252 \immediate\write\@auxout{\string\gdef\string\lastpage@lastpageHy{}}%
253 \addtocounter{page}{+1}%
254 \endgroup%
255 \fi%
256 \fi%
257 \fi%
258 }
259
```

`\lastpage@putlabelhyper` When `hyperref` has been loaded, the label is set with the `\lastpage@putlabelhyper` command. If the `hyperref` package is used, but `page-anchors` are disabled, the hyperlinking will not work. (The warning will also be shown, when only `\pageref*{LastPage}` is used (or neither one), but without messing with `\pageref` we cannot detect this.)

```
260 \newcommand{\lastpage@putlabelhyper}{%
261 \ifHy@pageanchor%
262 \else%
263 \PackageWarningNoLine{lastpage}{%
264 The \string\pageref{LastPage} link does not work\MessageBreak%
265 using hyperref with disabled option 'pageanchor'.\MessageBreak%
266 Better enable 'pageanchor' or use\MessageBreak%
267 \string\pageref*{LastPage} (not generating a link)%
268 }%
269 \fi%
```

Since the page has been put out, we are on the page *after* that page. We therefore subtract one from the page counter. (For the compiler, this is equal to

`\advance\c@page\m@ne`, but for human readers of the code it is probably easier to understand.)

```
270 \begingroup%
271 \addtocounter{page}{-1}%
```

Simply using `\label` for `LastPage` would not work, because labels wait for the output routines to work, and there may be no more invocations of the output routines. To force the write out, we need to do an `\immediate` write into the aux file.

```
272 %% with code from \Hy@EveryPageAnchor of the hyperref package,
273 %% 2010/04/17 v6.80x; newer versions are available
274 \let\@number\@firstofone%
275 \ifHy@pageanchor%
276 \ifHy@hypertextnames%
277 \ifHy@plainpages%
278 \def\Hy@temp{\arabic{page}}%
279 \else%
280 \Hy@unicodedefalse%
281 \ifnum \value{page}=1\relax%
```

We do not count the pages ourselves, and so they could have been changed by e.g. `\pagenumbering{...}`, `\addtocounter{page}{...}`, `\setcounter{page}{...}`. Thus the page might have the number one while not being the first page at all. Using the `everyshi` package would help, but this package should not require other packages. The `pageslts` package does a better handling, but requires some other packages.

We will make a mistake here at most once:

```
282 \ifx \lastpage@firstpage\lastpage@one\relax%
283 \def\Hy@temp{\thepage}%
284 \gdef\lastpage@firstpage{0}%
285 \else%
286 \pdfstringdef\Hy@temp{\thepage}%
287 \fi%
288 \else%
289 \pdfstringdef\Hy@temp{\thepage}%
290 \fi%
291 \fi%
292 \else%
293 \def\Hy@temp{\the\Hy@pagecounter}%
294 \fi%
295 \fi%
296 \immediate\write\@auxout{%
297 \string\newlabel{LastPage}{{}{\thepage}}{%
298 \ifHy@pageanchor page.\Hy@temp\fi}}%
299 }%
```

We also save the values, so that we can later (next rerun) check, whether they have been saved in the aux file.

```
300 \immediate\write\@auxout{\string\xdef\string\lastpage@lastpage{\thepage}}%
301 \ifHy@pageanchor%
302 \immediate\write\@auxout{\string\xdef\string\lastpage@lastpageHy{\Hy@temp}}%
303 \else%
304 \immediate\write\@auxout{\string\gdef\string\lastpage@lastpageHy{}}%
305 \fi%
```

After the writeout we restore the page number again, since there might be other things still to be done.

```
306 \addtocounter{page}{+1}%
307 \endgroup%
308 }
309
```

`\lastpage@putlabelNR` The nameref package redefines `\label` to have five arguments instead of two, therefore

`\newlabel{LastPage}{\thePage}` instead of  
`\newlabel{LastPage}{\thePage}` must be used:

```
310 \newcommand{\lastpage@putlabelNR}{%
311 \begingroup%
312 \addtocounter{page}{-1}%
313 \immediate\write\@auxout{\string\newlabel{LastPage}{\thePage}}%
314 \immediate\write\@auxout{\string\xdef\string\lastpage@lastpage{\thePage}}%
315 \immediate\write\@auxout{\string\gdef\string\lastpage@lastpageHy{}}%
316 \addtocounter{page}{+1}%
317 \endgroup%
318 }
319
```

`\lastpage@fileswtest` Later it will be determined whether it is allowed to write to the aux file. If it was *not* allowed, it is checked whether the label was already set via the aux file in some earlier compilation run. (There are packages where the document is compiled with access to the aux file, and then there is an additional compiler run, where the aux file cannot be changed, but in that run there is also no need to change it.) The `tikz` package is somewhat different, therefore we only give a warning instead of an error (and hope that there is another compiler run where the aux file can be written).

```
320 \newcommand{\lastpage@fileswtest}[2]{%
321 \edef\lastpage@testa{#1}%
322 \edef\lastpage@testb{#2}%
323 \ifx\lastpage@testa\lastpage@testb%
324 \else%
325 \ifx\lastpage@tikz\lastpage@one\relax%
326 \PackageWarning{lastpage}%
327 {The lastpage package was not allowed to write to an\MessageBreak%
328 .aux file. This package does not work without access\MessageBreak%
329 to an .aux file.\MessageBreak%
330 It is OK if the .aux file was already updated\MessageBreak%
331 by a previous compiler run\MessageBreak%
332 and would not have changed anyway.\MessageBreak%
333 }%
334 \else%
335 \PackageError{lastpage}{No auxiliary file allowed}%
336 {The lastpage package was not allowed to write to an .aux file.\MessageBreak%
337 This package does not work without access to an .aux file.\MessageBreak%
338 Press Ctrl+Z to exit.\MessageBreak%
339 But it is OK if the .aux file was already updated\MessageBreak%
340 by a previous compiler run\MessageBreak%
341 and would not have changed anyway.\MessageBreak%
342 }%
343 \fi%
344 \fi%
345 }
346
```

`\lastpage@fileswtestHy` When the `hyperref` package has been loaded, `\lastpage@lastpageHy` must be tested additionally. (And a `\newcommand` is needed, because `\ifHy@pageanchor` is not even defined when `hyperref` has not been loaded.)

```
347 \newcommand{\lastpage@fileswtestHy}{%
348 \ifHy@pageanchor%
349 \lastpage@fileswtest{\Hy@temp}{\lastpage@lastpageHy}%
350 \else%
351 \lastpage@fileswtest{\empty}{\lastpage@lastpageHy}%
352 \fi%
353 }
```



`\AtEndDocument` `\AtEndDocument` we again (re)define `\lastpage@putlabel` to do nothing and check `\lastpage@lastpage`, whether it is still unchanged, which is OK for the first run only.

```

354
355 \AtEndDocument{%
356 \ifx\lastpage@LTS\lastpage@one%
357 \else%
358 \gdef\lastpage@putlabel{??}%
359 \ifx\lastpage@lastpage\lastpage@putlabel\relax%
360 \PackageWarning{lastpage}{Rerun to get the references right}%
361 \fi%
362 \fi%
363 \gdef\lastpage@putlabel{\relax}%

```

It is checked whether writing to files is allowed (otherwise, only an error message is issued and nothing is done).

```
364 \if@filesw%
```

We put in a `\message` to show, in what order things (which were called) are done (see subsection 3.1).

```
365 \message{^^JAED: lastpage setting LastPage^^J}%
```

After this we issue a `\clearpage` to put out all floats, which are still floating, and place the `LastPage` label. Sometimes `\clearpage` might be undefined.

```

366 \@ifundefined{clearpage}{\relax}{\clearpage}%
367 \ifx\lastpage@french\lastpage@one% french or frenchle loaded
368 \addtocounter{page}{+1}\lastpage@putl@bel\addtocounter{page}{-1}%
369 \else% neither one loaded
370 \lastpage@putl@bel%
371 \fi%

```

When writing to files is not allowed, nothing can be done. But when the label was already set via the aux file, nothing needs to be done. We check for this with `\lastpage@fileswtest` and (if `hyperref` has been loaded) `\lastpage@fileswtestHy`.

```

372 \else%
373 \ifx\lastpage@LTS\lastpage@one%
374 \else%
375 \lastpage@fileswtest{\thepage}{\lastpage@lastpage}%
376 \ifx\lastpage@hyper\lastpage@one%
377 \lastpage@fileswtestHy%
378 \fi%
379 \fi%
380 \fi%
381 }

```

```
382 </lastpageclassic>
```

lastpagemodern.sty In case of a recent L<sup>A</sup>T<sub>E</sub>X-format, lastpagemodern.sty is loaded:

```
383 (*lastpagemodern)
384 %% Part of the "lastpage" package
385 \NeedsTeXFormat{LaTeX2e}[2023-06-01]
386 \ProvidesPackage{lastpagemodern}[2024-07-03 v2.1b %
387 Refers to last page's name (HMM; JPG)]
388 %% allows for things like "Page \thepage{} of \pageref{LastPage}"
389 %% to get "Page 7 of 9" or "Page VII of IX";
390 %% the NUMBER of pages is available via \@abspage@last, but with pages
391 %% for example I to X and then 1 to 10, the number of pages would be "20",
392 %% while the name of the last page is "10". Decide what you need/want!
393
```

For comparisons, “one” is defined (`\@one` does not work for this).

```
394 \gdef\lastpage@one{1}
```

We define `\lastpage@firstpage` to be “1”, and before re-definition via the `.aux` file, `\lastpage@lastpage` and `\lastpage@lastpageHy` are unknown.

```
395 \gdef\lastpage@firstpage{1}
396 \gdef\lastpage@lastpage{??}
397 \gdef\lastpage@lastpageHy{??}
398
```

`\lastpage@IfNumericTF` `\lastpage@IfNumericTF` was needed to determine whether a page number was numeric or not. Although it is no longer used, I am reluctant to remove it because it may have been used in other places in documents.

```
399 \newcommand\lastpage@gobbleminus[1]{\ifx-#1\else#1\fi}
```

which is from <https://texfaq.org/FAQ-isitanum>,

```
400 \newcounter{lastpagecount}
```

and similar to <https://tex.stackexchange.com/a/12811/17119>

```
401 \newcommand{\lastpage@IfNumericTF}[3]{%
402 \sbox\z@{\c@lastpagecount=0\lastpage@gobbleminus{#1}\relax}%
403 \ifdim\wd0>\z@\relax#3% is not numeric
404 \else#2% is numeric
405 \fi}
406
```

`\AddToHook{begindocument/end}` `\lastpage@putlabel`, used by older versions of this package, is/was redefined by other packages. While now `\lastpage@putl@bel` is used instead, other packages could also define a label `LastPage`, which then would be multiply defined. (Which is no big issue, if it is associated with the same page.) Therefore we define

```
407 \AddToHook{begindocument/end}{\gdef\lastpage@putlabel{\relax}}
408
```

Because `\lastpage@putlabel` might be (re)defined later, depending on the order in which the packages are loaded, we will do this again at the end of the document.

`\protected@iwrite` We need an `\immediate\protected@write`. Just `\immediate\write` had led to errors, for example when packages like `babel-greek` re-defined `\roman` (thanks to Ulrike Fischer for the report).

```
409 %% from https://tex.stackexchange.com/a/12811/542425
410 %% with thanks to Prof. Enrico Gregorio
411 \long\def\protected@iwrite#1#2#3{%
412 \begingroup%
413 #2%
414 \let\protect\@unexpandable@protect%
415 \edef\reserved@a{\immediate\write#1{#3}}%
```

```

416 \reserved@a%
417 \endgroup%
418 \if@nobreak\ifvmode\nobreak\fi\fi%
419 }
420

```

`\lastpage@makeHy` Just once we need the page from `\@currentHpage` without any “page.”:

```

421 \newcommand{\lastpage@makeHy}{%
422 \gdef\lastpage@Hy{}%
423 \IfPackageLoadedTF{hyperref}{%
424 \ifHy@pageanchor%
425 \@ifundefined{@currentHpage}{%
426 \PackageError{lastpage}{%
427 Kernel command \string\@currentHpage\space is undefined}{%
428 Please contact the lastpage maintainer.}%

```

`\gdef\lastpage@Hy{}`, but that was already done at the beginning of this command.

```

429 }{\xdef\lastpage@Hptest{Doc-Start}%
430 \ifx\lastpage@Hptest\@currentHpage\relax%
431 \gdef\lastpage@Hy{\@currentHpage}%
432 \else%
433 \edef\lastpage@Hptest{\@currentHpage}%
434 \ifx\lastpage@Hptest\empty\relax%

```

`\gdef\lastpage@Hy{}`, but that was already done at the beginning of this command.

```

435 \else%

```

`\@currentHpage` should be `page.<some number>`, `\lastpage@rmpage` removes the “page.”.

```

436 \gdef\lastpage@Hy{\lastpage@rmpage{\@currentHpage}}%
437 \fi%
438 \fi%
439 }%
440 \fi%
441 }{}%
442 }%
443

```

`\lastpage@rmpage` `\lastpage@rmpage` removes the “page.”, but just boldly assumes that #1 is now `page.<some number>`.

```

444 %% similar to https://tex.stackexchange.com/a/12811/6865
445 \def\lastpage@rmpage#1{\expandafter\lastpage@currentH#1\relax}
446 \def\lastpage@currentH#1.#2\relax{#2}
447

```

`\lastpage@putl@bel` This command does the writing of the label. If the `pageslts` package is used, this `lastpage` package is not needed at all. The `LastPage` label would even be defined twice. Thus, if `pageslts` is used, here nothing is done.

```

448 \newcommand{\lastpage@putl@bel}{%
449 \IfPackageLoadedTF{pageslts}{\relax}{%

```

Otherwise the label is set: If the `hyperref` package is used, but page-anchors are disabled, the hyperlinking will not work. (The warning will also be shown, when only `\pageref*{LastPage}` is used (or neither one), but without messing with `\pageref` we cannot detect this.)

```

450 \IfPackageLoadedTF{hyperref}{%
451 \IfPackageAtLeastTF{hyperref}{2023-11-07}{\relax}{%
452 \PackageError{lastpage}{hyperref package version too old}{%
453 required version: 2023-11-07 or newer, found version:\MessageBreak%
454 \csname ver@hyperref.sty\endcsname\MessageBreak%

```

```

455 Update hyperref or use lastpageclassic.sty instead of\MessageBreak%
456 lastpagemodern.sty!}}%
457 \ifHy@pageanchor\else%
458 \PackageWarningNoLine{lastpage}{%
459 The \string\pageref{LastPage} link does not work\MessageBreak%
460 using hyperref with disabled option 'pageanchor'.\MessageBreak%
461 Better enable 'pageanchor' or use\MessageBreak%
462 \string\pageref*{LastPage} (not generating a link)}%
463 \fi%
464 }{}%
465 \begingroup%

```

Since the page has been put out, we are on the page *after* that page. We therefore subtract one from the page counter. (For the compiler, this is equal to `\advance\c@page\m@ne`, but for human readers of the code it is probably easier to understand.)

```

466 \addtocounter{page}{-1}%

```

Simply using `\label` for `LastPage` would not work, because labels wait for the output routines to work, and there may be no more invocations of the output routines. To force the write out, we need to do an `\immediate` protected write into the aux file.

```

467 \protected@iwrite\@auxout{}{\string\newlabel{LastPage}{%
468 {\@currentlabel}{\thepage}{\@currentlabelname}%
469 {\IfPackageLoadedTF{hyperref}{\ifHy@pageanchor\currentHpage\fi%
470 }\@currentHref}}%
471 {\@kernel@reserved@label@data}}%
472 }%

```

We also save the values, so that we can later (next rerun) check, whether they have been saved in the aux file.

```

473 \protected@iwrite\@auxout{}{%
474 \string\gdef\string\lastpage@lastpage{\thepage}}%
475 \lastpage@makeHy%
476 \protected@iwrite\@auxout{}{%
477 \string\gdef\string\lastpage@lastpageHy{\lastpage@Hy}}%

```

After the write-out we restore the page number again, since there might be other things still to be done.

```

478 \addtocounter{page}{+1}%
479 \endgroup%
480 }%
481 }
482

```

`\lastpage@fileswtest` Later it will be determined whether it is allowed to write to the aux file. If it was *not* allowed, it is checked whether the label was already set via the aux file in some earlier compilation run. (There are packages where the document is compiled with access to the aux file, and then there is an additional compiler run, where the aux file cannot be changed, but in that run there is also no need to change it.) The `tikz` package is somewhat different, therefore we only give a warning instead of an error (and hope that there is another compiler run where the aux file can be written).

```

483 \newcommand{\lastpage@fileswtest}[2]{%
484 \edef\lastpage@testa{#1}%
485 \edef\lastpage@testb{#2}%
486 \ifx\lastpage@testa\lastpage@testb%
487 \else%
488 \IfPackageLoadedTF{tikz}{%
489 \PackageWarning{lastpage}%
490 {The lastpage package was not allowed to write to an\MessageBreak%
491 .aux file. This package does not work without access\MessageBreak%

```

```

492 to an .aux file.\MessageBreak%
493 It is OK if the .aux file was already updated\MessageBreak%
494 by a previous compiler run\MessageBreak%
495 and would not have changed anyway.\MessageBreak%
496 }%
497 }{\PackageError{lastpage}{No auxiliary file allowed}%
498 {The lastpage package was not allowed to write to an .aux file.\MessageBreak%
499 This package does not work without access to an .aux file.\MessageBreak%
500 Press Ctrl+Z to exit.\MessageBreak%
501 But it is OK if the .aux file was already updated\MessageBreak%
502 by a previous compiler run\MessageBreak%
503 and would not have changed anyway.\MessageBreak%
504 }%
505 }%
506 \fi%
507 }
508

```

`\lastpage@fileswtestHy` When the hyperref package has been loaded, `\lastpage@lastpageHy` must be tested additionally. (And a `\newcommand` is needed, because `\ifHy@pageanchor` is not even defined when hyperref has not been loaded.)

```

509 \newcommand{\lastpage@fileswtestHy}{%
510 \ifHy@pageanchor%
511 \lastpage@fileswtest{\@currentHpage}{\@theH@page}%
512 \else%
513 \lastpage@fileswtest{\empty}{\lastpage@lastpageHy}%
514 \fi%
515 }
516

```

`enddocument/afterlastpage` `enddocument/afterlastpage` we again (re)define `\lastpage@putlabel` to do nothing, but first use it to check whether `\lastpage@lastpage` is still unchanged, which is OK for the first run only.

```

517 \AddToHook{enddocument/afterlastpage}{%
518 \IfPackageLoadedTF{pageslts}{\relax}{%
519 \gdef\lastpage@putlabel{??}%
520 \ifx\lastpage@lastpage\lastpage@putlabel\relax%
521 \AddToHook{enddocument/info}{%
522 \PackageWarning{lastpage}{Rerun to get the references right}%
523 }%
524 \fi%
525 }%
526 \gdef\lastpage@putlabel{\relax}%

```

It is checked whether writing to files is allowed (otherwise, only an error message is issued and nothing is done).

```

527 \if@filesw%

```

We put in a `\message` to show, in what order things (which were called) are done.

```

528 \message{^^Jenddocument/afterlastpage: lastpage setting LastPage.^^J}%
529 \IfPackageLoadedTF{french}{%
530 \addtocounter{page}{+1}\lastpage@putlabel\addtocounter{page}{-1}%
531 }{\IfPackageLoadedTF{frenchle}{%
532 \addtocounter{page}{+1}\lastpage@putlabel\addtocounter{page}{-1}%
533 }{\lastpage@putlabel%
534 }%
535 }%
536 \else%

```

When writing to files is not allowed, nothing can be done. But when the label was already set via the aux file, nothing needs to be done. We

check for this with `\lastpage@fileswtest` and (if `hyperref` has been loaded)  
`\lastpage@fileswtestHy`.

```
537 \IfPackageLoadedTF{pageslts}{\relax}{%
538 \lastpage@fileswtest{\thepage}{\lastpage@lastpage}%
539 \IfPackageLoadedTF{hyperref}{\lastpage@fileswtestHy}{\relax}%
540 }%
541 \fi%
542 }
543 \end{lastpagemodern}
```

## 7 Installation

### 7.1 Downloads

Everything is available at <https://www.ctan.org>, but may need additional packages themselves.

`lastpage.dtx` For unpacking the `lastpage.dtx` file and constructing the documentation it is required:

- T<sub>E</sub>XFormat L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>: <https://www.CTAN.org>
- document class `ltxdoc`, 2024/02/08, v2.1j, <https://ctan.org/pkg/ltxdoc>
- package `holtxdoc`, 2019/12/09, v0.30, <https://ctan.org/pkg/holtxdoc>

`lastpage.sty` The `lastpage.sty` (i. e. each document using the `lastpage` package) requires:

- T<sub>E</sub>X, <https://www.CTAN.org>
- package `lastpage`, 2024-07-03, v2.1b, <https://ctan.org/pkg/lastpage>

`lastpage209.sty` The `lastpage209.sty` for L<sup>A</sup>T<sub>E</sub>X2.09 (i. e. each document using the `lastpage209` package) requires:

- T<sub>E</sub>X-format L<sup>A</sup>T<sub>E</sub>X, v2.09
- package `lastpage209`, 2024-07-03, v2.1b, <https://ctan.org/pkg/lastpage>

and does not work with `hyperref`, which needs L<sup>A</sup>T<sub>E</sub>X2e.

`lastpage2e.sty` The `lastpage2e.sty` for L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> (i. e. each document using the `lastpage2e` package) requires:

- T<sub>E</sub>X-format L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> 1994/12/01 or newer, <https://www.CTAN.org>
- package `lastpage`, 2024-07-03, v2.1b, <https://ctan.org/pkg/lastpage>

`lastpageclassic.sty` The `lastpageclassic.sty` for L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> (i. e. each document using the `lastpageclassic` package) requires:

- T<sub>E</sub>X-format L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> between 1994/12/01 and 2023-05-31, <https://www.CTAN.org>

- package `lastpage`, 2024-07-03, v2.1b, <https://ctan.org/pkg/lastpage>

and can use

- package `hyperref`, 2023-07-08, v7.01b, <https://ctan.org/pkg/hyperref> (probably also some older and newer versions)

`lastpagemodern.sty` The `lastpagemodern.sty` for L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> (i. e. each document using the `lastpagemodern` package) requires:

- T<sub>E</sub>X-format L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> 2023-06-01 or newer, <https://www.CTAN.org>

- package `lastpage`, 2024-07-03, v2.1b, <https://ctan.org/pkg/lastpage>

and can use

- package `hyperref`, 2023-11-07 and newer (tested with: 2024-05-23, v7.01i), <https://ctan.org/pkg/hyperref>

`lastpage-example.tex` The `lastpage-example.tex` requires the same file as all documents using the `lastpage` package, i. e.

- package `lastpage`, 2024-07-03, v2.1b, <https://ctan.org/pkg/lastpage>  
(Well, it is the example file for this package, and because you are reading the documentation for the `lastpage` package, it can be assumed that you already have some version of it – is it the current one?)

and additionally:

- class `article`, 2024-02-08, v1.4n, from classes: <https://ctan.org/pkg/classes>
- package `showkeys`, 2024-05-23, v3.21, <https://ctan.org/pkg/showkeys>
- package `hyperref`, 2024-05-23, v7.01i, <https://ctan.org/pkg/hyperref>

`endfloat` The `endfloat` package is not required, but because the `lastpage` package is incompatible with *ancient* versions of the `endfloat` package (see subsection 3.2), here the recent one (at the time of writing this documentation) is listed:

- package `endfloat`, 2019/04/15, v2.7, <https://ctan.org/pkg/endfloat>

`fancyhdr` Neither the `fancyhdr` nor the `nccfancyhdr` package is required (older versions of `nccfancyhdr` the `lastpage` package used its predecessor `fancyheadings`), but because they were mentioned, also they are listed here:

- package `fancyhdr`, 2024/04/23, v4.2, <https://ctan.org/pkg/fancyhdr>
- package `nccfancyhdr`, 2004/12/07, v1.1, <https://ctan.org/pkg/nccfancyhdr>

`count1to` As possible alternatives in section 4, Alternatives, there are listed (newer versions might be available):

`nofm`

`totpages`

`lastpage`

- package `pageslts`, 2015/12/21, v1.2f, <https://ctan.org/pkg/pageslts>

`totalcount`

`zref`

`memoir`

- package `papermas`, 2023-04-12, v1.1a; the `papermas` package can be considered as kind of add-on to the `pageslts` package.  
<https://ctan.org/pkg/papermas>
- package `count1to`, 2009/05/24, v2.1, <https://ctan.org/pkg/count1to>
- package `nofm`, 1991/02/25, <https://mirror.ctan.org/obsolete/macros/latex209/contrib/misc/nofm.sty>, does not work with e. g. `hyperref`
- package `totpages`, 2005/09/19, v2.00, <https://ctan.org/pkg/totpages>
- package `totalcount`, 2018/01/21, v1.0a, <https://ctan.org/pkg/totalcount>
- package `zref`, 2023-09-14, v2.35, <https://ctan.org/pkg/zref>
- class `memoir`, 2024-01-26, v3.8.2, <https://ctan.org/pkg/memoir>.

`Oberdiek` All packages of the ‘`oberdiek`’ bundle (especially `holtxdoc` and `zref`) are also available in a TDS compliant ZIP archive:

`holtxdoc`

`zref` <https://mirror.ctan.org/install/macros/latex/contrib/oberdiek.tds.zip>.  
It is probably best to download and use this, because the packages in there are quite probably both recent and compatible among themselves.

`hyperref` `hyperref` is not included in that bundle and needs to be downloaded separately, <https://mirror.ctan.org/install/macros/latex/contrib/hyperref.tds.zip>.

`Münch` A hyperlinked list of my (other) packages can be found at <https://ctan.org/author/muench-hm>.



## 7.2 Package, unpacking TDS

**Package.** This package is available on <https://www.CTAN.org>.

<https://mirror.ctan.org/macros/latex/contrib/lastpage/lastpage.dtx>  
The source file.

<https://mirror.ctan.org/macros/latex/contrib/lastpage/lastpage.pdf>  
The documentation.

<https://mirror.ctan.org/macros/latex/contrib/lastpage/lastpage-example.pdf>  
The compiled example file, as it should look like.

<https://mirror.ctan.org/macros/latex/contrib/lastpage/README>  
The README file.

There is also a `lastpage.tds.zip` available:

<https://mirror.ctan.org/install/macros/latex/contrib/lastpage.tds.zip>  
Everything in TDS compliant, compiled format

which additionally contains

|                                   |                                                                       |
|-----------------------------------|-----------------------------------------------------------------------|
| <code>lastpage.ins</code>         | The installation file.                                                |
| <code>lastpage.drv</code>         | The driver to generate the documentation.                             |
| <code>lastpage.sty</code>         | The style file.                                                       |
| <code>lastpage209.sty</code>      | The style file for L <sup>A</sup> T <sub>E</sub> X2.09 <b>only</b> .  |
| <code>lastpage2e.sty</code>       | The style file to determine which 2e-style to use.                    |
| <code>lastpageclassic.sty</code>  | The style file for older L <sup>A</sup> T <sub>E</sub> X-formats.     |
| <code>lastpagemodern.sty</code>   | The style file for the recent L <sup>A</sup> T <sub>E</sub> X-format. |
| <code>lastpage-example.tex</code> | The example file.                                                     |

For required other packages please see the preceding subsection.

**Unpacking.** The `.dtx` file is a self-extracting `docstrip` archive. The files are extracted by running the `..dtx` through plain T<sub>E</sub>X:

```
tex lastpage.dtx
```

About generating the documentation see paragraph 7.4 below.

**TDS.** Now the different files must be moved into the different directories in your installation TDS tree (also known as `texmf` tree):

|                                   |                                               |
|-----------------------------------|-----------------------------------------------|
| <code>lastpage.sty</code>         | → <code>tex/latex/lastpage.sty</code>         |
| <code>lastpage209.sty</code>      | → <code>tex/latex/lastpage.sty</code>         |
| <code>lastpage2e.sty</code>       | → <code>tex/latex/lastpage.sty</code>         |
| <code>lastpageclassic.sty</code>  | → <code>tex/latex/lastpage.sty</code>         |
| <code>lastpagemodern.sty</code>   | → <code>tex/latex/lastpage.sty</code>         |
| <code>lastpage.pdf</code>         | → <code>doc/latex/lastpage.pdf</code>         |
| <code>lastpage-example.tex</code> | → <code>doc/latex/lastpage-example.tex</code> |
| <code>lastpage-example.pdf</code> | → <code>doc/latex/lastpage-example.pdf</code> |
| <code>lastpage.dtx</code>         | → <code>source/latex/lastpage.dtx</code>      |

If you have a `docstrip.cfg` that configures and enables `docstrip`'s TDS installing feature, then some files can already be in the right place, see the documentation of `docstrip`.

## 7.3 Refresh file name databases

If your T<sub>E</sub>X distribution (T<sub>E</sub>X Live, MiK<sub>T</sub>E<sub>X</sub>, ...) relies on file name databases, you must refresh these. For example, T<sub>E</sub>X Live users run `texhash` or `mktexlsr`.

## 7.4 Some details for the interested

**Unpacking with  $\LaTeX$ .** The `.dtx` chooses its action depending on the format:

**plain  $\TeX$ :** Run `docstrip` and extract the files.

**$\LaTeX$ :** Generate the documentation.

If you insist on using  $\LaTeX$  for `docstrip` (really, `docstrip` does not need  $\LaTeX$ ), then inform the autodetect routine about your intention:

```
latex \let\install=y\input{lastpage.dtx}
```

Do not forget to quote the argument according to the demands of your shell.

**Generating the documentation.** You can use both the `.dtx` or the `.drv` to generate the documentation. The process can be configured by a configuration file `ltxdoc.cfg`. For instance, put the following line into this file, if you want to have A4 as paper format:

```
\PassOptionsToClass{a4paper}{article}
```

An example follows how to generate the documentation with `pdf $\LaTeX$` :

```
pdflatex lastpage.dtx
makeindex -s gind.ist lastpage.idx
pdflatex lastpage.dtx
makeindex -s gind.ist lastpage.idx
pdflatex lastpage.dtx
```

## 7.5 Compiling the example

The example file, `lastpage-example.tex`, can be compiled via

```
latex lastpage-example.tex
```

or (recommended)

```
pdflatex lastpage-example.tex
```

and will need at least two compiler runs to get all references right.

## 8 Acknowledgements

I (H.-MARTIN MÜNCH) would like to thank JEFFREY P. GOLDBERG (`jefrey+news at goldmark dot org`) for inventing the `lastpage` package as well as for allowing me to update it. Further I would like to thank HEIKO OBERDIEK for providing a lot (!) of useful packages (from which I also learned everything I know about creating a file in `dtx` format, OK, say it: copying). Thanks for bug reports go to ULRIKE FISCHER (several times), SEBASTIAN BANK, JAMES HEDGES, MIKHAIL TITOV, MICHAŁ HERMAN, MATTEO GAMBOZ, and JAMES SMALL. Thanks to SVEN SIEGMUND for pointing out a necessary further explanation in the documentation.

## 9 History

[1994/06/17 v0.99a]

- First shot by JEFFREY P. GOLDBERG.

[1994/06/25 v0.1b]

- Last version number created by JEFFREY P. GOLDBERG.

## [1994/07/20 v0.1b (again)]

- Documentation updated by JEFFREY P. GOLDBERG.  
The main source code of the `lastpage` package 1994/07/20, v0.1b, was:

```
\NeedsTeXFormat{LaTeX2e}[1994/06/01]
\ProvidesPackage{lastpage}[1994/07/20 v0.1b
 LaTeX2e package for refs to last page number (JPG)]
\def\lastpage@putlabel{\addtocounter{page}{-1}%
 \immediate\write\@auxout{\string
 \newlabel{LastPage}{\the\page}}%
 \addtocounter{page}{1}}
\AtEndDocument{%
 \message{AED: lastpage setting LastPage}%
 \clearpage\lastpage@putlabel}%
\endinput
```

and then the `hyperref` package (2012/11/06, v6.83m) even redefined `\lastpage@putlabel`; the REV $\TeX$ 4 class 2022-06-05, v4.2f, still does this.

## [2010/02/18 v1.1]

- Proposed `LastPages` label by H.-MARTIN MÜNCH on [news:comp.text.tex](https://groups.google.com/g/comp.text.tex/c/Ad8pO2Rw_HY/m/8EfHqT1JBOQJ), see e. g. [https://groups.google.com/g/comp.text.tex/c/Ad8pO2Rw\\_HY/m/8EfHqT1JBOQJ](https://groups.google.com/g/comp.text.tex/c/Ad8pO2Rw_HY/m/8EfHqT1JBOQJ); now available in the `pageslts` package.

## [2010/07/29 v1.2a]

- Complete rewriting of the package; upgrade from `fancyheadings` to `fancyhdr` package, then removed the need for the `fancyhdr` package at all.
- Included `lastpage209.sty` for L $\TeX$ 2.09.
- Replacement of `\filedate`, `-version`, `-name`,... because of L $\TeX$  bug 2705:  
Synopsis: Possible problem with `\fileversion` and `\filedate`  
<https://www.latex-project.org/cgi-bin/ltxbugs2html?category=LaTeX&responsible=anyone&state=anything&keyword=lastpage&pr=latex/2705>
- Example `lastpage-example.tex`.
- Alternatives listing (section 4).
- Listing of  $\TeX$  sources (subsection 7.1).
- Really a lot of details.
- Complete rewriting of the documentation.
- Everything in DTX framework.
- Included a `\Checksum`. [Removed in v2.0a.]
- Complete rewriting of the README file.

### [2010/08/12 v1.2b]

- Bug fix: `\@PackageInfoNoLine` is only available, if the `hyperref` package is loaded. (Bug reported by ULRIKE FISCHER, thanks!)
- Bug fix: `\ifHy@pageanchor` etc. do not work without `hyperref`, and `\else` related to `\ifHy@pageanchor` was wrongly associated with a preceding `\if`, and everything went wrong. Now everything should work again also without `hyperref`.
- Renamed `\lastpage@putlabel` to `\lastpage@putlabel` to get rid of the conflicts with other classes and packages and resulting multiple definitions of the `lastpage` label.

### [2010/08/23 v1.2c]

- Bug fix: Additionally to checking for the `hyperref` package `\AtBeginDocument`, when placing the `lastpage` label it is also checked for the `\hyperref` command, in case `hyperref` was not loaded at `\begin{document}` yet. (Bug reported by SEBASTIAN BANK, thanks!) [`lastpagemodern.sty` just uses `\IfPackageLoadedTF{hyperref}`.]
- Changed the `\unit` definition (got rid of an old `\rm`). [Removed in v2.0a.]
- Changed `\lastpage@puthyperlabel` to `\lastpage@putlabelhyper` analogous to `\pagesLTS@putlabelhyper` of the `pageslts` package.
- Updated version number and date of `pagesLTS` package (especially for the check for outdated versions). [Removed in v2.0a.]
- Removed wrong `%` from the driver file.

### [2010/08/25 v1.2d]

- Bug fix: also `tcilatex` defines the `\hyperref` command, therefore for `hyperref` package detection this had to be changed to `\Hy@Warning`. [`lastpagemodern.sty` just uses `\IfPackageLoadedTF{hyperref}`.]

### [2010/09/12 v1.2e]

- JAMES HEDGES pointed out, that there was no instruction in the documentation about suppressing hyperlinks: added (also to the example).
- Diverse small changes.

### [2010/09/24 v1.2f]

- Updated to version 2010/09/13 v6.81n of the `hyperref` package.
- New version of `REVTEX4` 2010/07/25, v4.1r, old problem.
- New version of `pagesLTS` package, 2010/09/22, v1.1k.
- Moved the package from `.../latex/muench/lastpage/...` to `.../latex/lastpage/...`

### [2011/02/01 v1.2g]

- Updated to version 2010/04/24 v0.19 of the `holtxdoc` package.
- New version of `pagesLTS` package, 2011/02/01, v1.1m.
- Updated to version 2010/12/16 v6.81z of the `hyperref` package.
- Minor details.

### [2011/07/03 v1.2h]

- The `holtxdoc` package was fixed, therefore the warning in `drv` could be removed. – Adapted the style of this documentation to new OBERDIEK `dtx` style.
- New versions of `pagesLTS`, `ulem`, `hyperref`, `papermas` packages.
- Corrected references in the README and manual.

### [2011/08/08 v1.2i]

- The `pagesLTS` package has been renamed to `pageslts`: 2011/08/08, v1.2a.
- Some details.

### [2011/08/31 v1.2j]

- Updated to T<sub>E</sub>X Live 2011 (for compiling the documentation and example).
- New version of `papermas` package, 2011/08/22, v1.0h.
- Adapted for the use together with packages, which sometimes prevent writing to the `aux` file. (Bug reported by MIKHAIL TITOV.)

### [2011/09/01 v1.2k]

- Fixed `\thepage{}` to `29_`, where there should be a space.
- New version of the `hyperref` package, 2011/08/19, v6.82h, but still problem with links to pages with page-“number” in `fnsymbol` pag numbering scheme. [Fixed since v6.83m as of 2012/11/06.]
- Documentation update about “No write access to the `aux` file”.

### [2013/01/28 v1.2l]

- Updated to T<sub>E</sub>X Live 2012 (for compiling the documentation and example).
- New versions of the packages `endfloat`, `holtxdoc`, `hypdoc`, `hyperref`, `pageslts`, `regstats`, `ulem`, and `zref` have become available.
- The `nameref` package redefines `\label` to have five arguments instead of two, therefore `\newlabel{LastPage}{\thepage}{\thepage}` instead of `\newlabel{LastPage}{\thepage}` must be used. (Bug reported at <https://tex.stackexchange.com/q/95541>, thanks to MICHAŁ HERMAN!) Fixed.  
[Since L<sup>A</sup>T<sub>E</sub>X release 2023-06-01 five arguments are standard.]

### [2015/03/29 v1.2m]

- Updated to T<sub>E</sub>X Live 2014 (for compiling the documentation and example).
- Updates to really a lot of details in the documentation (manual & README).

### [2021/09/03 v1.2n]

- Updates to the documentation (manual & README), to the example, and several small changes in code.
- This version has been archived at <https://web.archive.org/web/20230305193232/https://mirror.ctan.org/install/macros/latex/contrib/lastpage.tds.zip>.

### [2023-03-07 v2.0a]

- Removed use of `ulem`.
- Removed `\unit`.
- `lastpage` should now determine automatically, whether to load its  $\TeX$  2.09 version, classic  $\LaTeX$ 2 $\epsilon$ -version, or modern version with  $\epsilon$ - $\TeX$ , hook-management etc.
- Converted to UTF-8.
- Updated to  $\LaTeX$  format 2022-11-01.
- Extensive updates to the documentation (manual & README) and to the example.

### [2023-04-12 v2.0b]

- Bug fix: What should have been `}}{}` was `}{}}`. Thanks to MATTEO GAMBOZ!

### [2023-07-24 v2.0c]

- Since  $\LaTeX$  release 2023-06-01 labels have always five arguments.
- Removed the incompatibility warning regarding `endfloat` before 1994-06-01 (!) from `lastpagemodern.sty`.
- Replaced `\immediate\write` by a form of (pseudo-code!) `\immediate\protected@write`. (Thanks to ULRIKE FISCHER for the error report and solution!)
- Update of the `\lastpage@putl@bel` code to `hyperref` 2023-07-08, v7.01b, which now allows `fnsymbol` as page numbering scheme (while links to, for example, a page named `||` still do not work).

### [2023-10-06 v2.0d]

- For plain arabic page numbers only, `lastpage` again writes the page number in a plain format in the label in the `aux` file, so that it can be extracted to perform calculations with it.

### [2023-10-14 v2.0e]

- Replaced a `\PackageError` by `\PackageWarningNoLine` as suggested by ULRIKE FISCHER.

### [2024-04-27 v2.1a]

- Utilizes the new `\@currentHpage` provided by the  $\LaTeX$ -kernel.
- The issue with `\thepage` (former `\lastpage@nonnumeric` command) has been fixed at 2023-11-07, <https://github.com/latex3/hyperref/issues/303>.
- `\lastpage@IfNumericTF` is no longer needed, but has not been removed so as not to break older documents that use it in a different context.

[2024-07-03 v2.1b]

- The beamer class loads hyperref partially, so that hyperref is incorrectly detected as having been loaded. The defining operation for `\lastpage@Hy` has been changed to catch this and other different cases.

When you find a mistake or have a suggestion for an improvement of this package, please send an e-mail to the maintainer, thanks! (Please see BUG REPORTS in the README.)

## 10 Index

Numbers written in *italic* refer to the page where the corresponding entry is described; numbers underlined refer to the code line of the definition; plain numbers refer to the code lines where the entry is used.

| Symbols                                         |                                                                      |
|-------------------------------------------------|----------------------------------------------------------------------|
| <code>\@abspage@last</code> .....               | 390                                                                  |
| <code>\@currentHpage</code> .....               | 427, 430, 431, 433, 436, 469, 511                                    |
| <code>\@currentHref</code> .....                | 470                                                                  |
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