The ltxcmds package

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Abstract

The package ltxcmds exports some utility macros from the LaTeX kernel into a separate namespace and also provides them for other formats such as plain-TeX.

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*Please report any issues at https://github.com/ho-tex/oberdiek/issues

1 Documentation

1.1 Introduction

Many of my packages also support other formats such as plain-TEX. Because I am rather familiar with the utility macros from LATEX's kernel (e.g. `\@gobble`, `\@firstoftwo`), I found myself rewriting them again and again, because they are lacking in plain-TEX.

Therefore this package provides often used macros and similar ones with the name prefix `\ltx@`. This avoids also faulty redefinitions. I remember an example where a package redefined `\@firstoftwo` with forgetting `\long`.

1.2 Numbers

`\ltx@zero`	→	0
`\ltx@one`	→	1
`\ltx@two`	→	2
`\ltx@cclv`	→	255
`\ltx@minusone`	→	-1

These commands are numbers 0, 1, 2, 255 and -1. They are not digits and a space is not gobbled afterwards. Macro `\ltx@minusone` is available since version 2010/12/12 v1.15.

1.3 Scratch registers

Following the conventions of plain TEX and LATEX the first ten registers are free to use. Even numbered registers are for local, odd numbered for global use.

`\ltx@(Loc,Glob)(Toks,Dimen,Skip)(A,B,C,D,E)`

The name consists of the prefix `\ltx@`, then `Loc` or `Glob` for local or global usage follows. The register type is given by `Toks` for token register, `Dimen` for dimen register and `Skip` for skip register. As last part the registers are numbered from `A` to `E`. Example: `\ltx@LocToksA`.

Since 2011/04/14 v1.19.

1.4 Argument killers

`\ltx@gobble {`⟨*1*⟩`}`	→
`\ltx@gobbletwo {`⟨*1*⟩`} {`⟨*2*⟩`}`	→
`\ltx@gobblethree {`⟨*1*⟩`} {`⟨*2*⟩`} {`⟨*3*⟩`}`	→
`\ltx@gobblefour {`⟨*1*⟩`} {`⟨*2*⟩`} {`⟨*3*⟩`} {`⟨*4*⟩`}`	→

`\ltx@GobbleNum {`⟨*num*⟩`} {`⟨*1*⟩`} {`⟨*2*⟩`} … {`⟨⟨*num*⟩⟩`}`	→

The first argument ⟨*num*⟩ of macro `\ltx@GobbleNum` specifies, how many following arguments are eaten. Macro `\ltx@GobbleNum` is expandable in exact two expansion steps.

1.5 Argument grabbers

`\ltx@firstofone {`⟨*1*⟩`}`	→	⟨*1*⟩
`\ltx@firstoftwo {`⟨*1*⟩`} {`⟨*2*⟩`}`	→	⟨*1*⟩
`\ltx@secondoftwo {`⟨*1*⟩`} {`⟨*2*⟩`}`	→	⟨*2*⟩
`\ltx@firstofthree {`⟨*1*⟩`} {`⟨*2*⟩`} {`⟨*3*⟩`}`	→	⟨*1*⟩
`\ltx@secondofthree {`⟨*1*⟩`} {`⟨*2*⟩`} {`⟨*3*⟩`}`	→	⟨*2*⟩
`\ltx@thirdofthree {`⟨*1*⟩`} {`⟨*2*⟩`} {`⟨*3*⟩`}`	→	⟨*3*⟩
`\ltx@firstoffour {`⟨*1*⟩`} {`⟨*2*⟩`} {`⟨*3*⟩`} {`⟨*4*⟩`}`	→	⟨*1*⟩
`\ltx@secondoffour {`⟨*1*⟩`} {`⟨*2*⟩`} {`⟨*3*⟩`} {`⟨*4*⟩`}`	→	⟨*2*⟩
`\ltx@thirdoffour {`⟨*1*⟩`} {`⟨*2*⟩`} {`⟨*3*⟩`} {`⟨*4*⟩`}`	→	⟨*3*⟩
`\ltx@fourthoffour {`⟨*1*⟩`} {`⟨*2*⟩`} {`⟨*3*⟩`} {`⟨*4*⟩`}`	→	⟨*4*⟩

Macros `\ltx@firstofthree`, `\ltx@secondofthree` and `\ltx@thirdofthree` were added in version 2010/11/12 v1.11. Macros `\ltx@firstoffour`, …, `\ltx@fourthoffour` were added in version 2011/02/04 v1.16.

1.6 List helpers

`\ltx@carzero … \@nil`	→	
`\ltx@cdrzero … \@nil`	→	…

`\ltx@car {`⟨*1*⟩`} … \@nil`	→	⟨*1*⟩
`\ltx@cdr {`⟨*1*⟩`} … \@nil`	→	…

`\ltx@cartwo {`⟨*1*⟩`} {`⟨*2*⟩`} … \@nil`	→	⟨*1*⟩⟨*2*⟩
`\ltx@carsecond {`⟨*1*⟩`} {`⟨*2*⟩`} … \@nil`	→	⟨*2*⟩
`\ltx@cdrtwo {`⟨*1*⟩`} {`⟨*2*⟩`} … \@nil`	→	…

`\ltx@carthree {`⟨*1*⟩`} {`⟨*2*⟩`} {`⟨*3*⟩`} … \@nil`	→	⟨*1*⟩⟨*2*⟩⟨*3*⟩
`\ltx@carthird {`⟨*1*⟩`} {`⟨*2*⟩`} {`⟨*3*⟩`} … \@nil`	→	⟨*3*⟩
`\ltx@cdrthree {`⟨*1*⟩`} {`⟨*2*⟩`} {`⟨*3*⟩`} … \@nil`	→	…

`\ltx@carfour {`⟨*1*⟩`} {`⟨*2*⟩`} {`⟨*3*⟩`} {`⟨*4*⟩`} … \@nil`	→	⟨*1*⟩⟨*2*⟩⟨*3*⟩⟨*4*⟩
`\ltx@carfourth {`⟨*1*⟩`} {`⟨*2*⟩`} {`⟨*3*⟩`} {`⟨*4*⟩`} … \@nil`	→	⟨*4*⟩
`\ltx@cdrfour {`⟨*1*⟩`} {`⟨*2*⟩`} {`⟨*3*⟩`} {`⟨*4*⟩`} … \@nil`	→	…

`\ltx@CarNum {`⟨*num*⟩`} {`⟨*1*⟩`} … {`⟨⟨*num*⟩⟩`} {`⟨⟨*num*⟩+*1*⟩`} … \@nil`	→	`{`⟨*1*⟩`} … {`⟨⟨*num*⟩⟩`} …`
`\ltx@CarNumth {`⟨*num*⟩`} {`⟨*1*⟩`} … {`⟨⟨*num*⟩⟩`} {`⟨⟨*num*⟩+*1*⟩`} … \@nil`	→	`{`⟨⟨*num*⟩⟩`} …`
`\ltx@CdrNum {`⟨*num*⟩`} {`⟨*1*⟩`} … {`⟨⟨*num*⟩⟩`} {`⟨⟨*num*⟩+*1*⟩`} … \@nil`	→	`{`⟨⟨*num*⟩+*1*⟩`} …`

Macros with uppercase letters are expandable in two expansion steps. Changes in version 2016/05/16 v1.23:

- Macros `\ltx@carsecond`, `\ltx@carthird`, `\ltx@carfourth`, `\ltx@CarNumth` added.
- Macros `\ltx@cdr`, `\ltx@cdrtwo`, `\ltx@cdrthree`, `\ltx@cdrfour`, `\ltx@CdrNum` are expandable in two expansion steps and retain spaces and braces after the first gobbled arguments.

1.7 Tail recursion

`\ltx@ReturnAfterFi {`⟨*1*⟩`} \fi`	→	`\fi` ⟨*1*⟩
`\ltx@ReturnAfterElseFi {`⟨*1*⟩`} \else {`⟨*2*⟩`} \fi`	→	`\fi` ⟨*1*⟩

1.8 Empty macro

`\ltx@empty`	→

1.9 Characters

`\ltx@space`	→	␣	
`\ltx@percentchar`	→	`%`	
`\ltx@backslashchar`	→	`\`	
`\ltx@hashchar`	→	`#`	(since v1.7)
`\ltx@leftbracechar`	→	`{`	(since v1.8)
`\ltx@rightbracechar`	→	`}`	(since v1.8)

1.10 Boolean switch

`\ltx@newif {`⟨*cmd*⟩`}`

`\ltx@newif` defines a new boolean switch ⟨*cmd*⟩ like `\newif`. Unlike plain TEX's `\newif`, `\ltx@newif` is not `\outer`. The command ⟨*cmd*⟩ must start with the two characters `if`.

`\ltx@newglobalif {`⟨*cmd*⟩`}`

`\ltx@newglobalif` defines a new boolean switch ⟨*cmd*⟩ like `\ltx@newif`. However the switch setting commands, ⟨*cmd*⟩ without the prefix `if` and followed by `true` or `false` are acting globally.

1.11 Command definitions

`\ltx@ifundefined {`⟨*cmd*⟩`} {`⟨*yes*⟩`} {`⟨*no*⟩`}`

If ε-TEX is available, `\ifcsname` is used that does not have the side effect of defining undefined commands with meaning of `\relax`. This command is always expandable. Change in version 1.1: Also the meaning `\relax` is always considered "undefined".

`\ltx@IfUndefined {`⟨*cmd*⟩`} {`⟨*yes*⟩`} {`⟨*no*⟩`}`

If ε-TEX is available, `\ifcsname` is used that does not have the side effect of defining undefined commands with meaning of `\relax`. Also it always checks for the meaning of `\relax` and considers this as undefined. This macro is not expandable without ε-TEX.

`\ltx@LocalExpandAfter`

It expands the token after the next token but in a local context. That is the difference to `\expandafter`. The local context discards the side effect of `\csname` and let the command undefined after the expansion step.

1.12 Stripping

`\ltx@RemovePrefix`
`\ltx@StripPrefix`

All tokens up to and including the next available character '>' are thrown away. Usually it is used to strip the first part of the output of the commands `\meaning` or `\pdflastmatch`. Macro `\ltx@RemovePrefix` has the same meaning as LaTeX's `\strip@prefix`, whereas macro `\ltx@StripPrefix` expands the next token once before stripping the prefix.

`\ltx@onelevel@sanitize {`⟨*macro*⟩`}`

Macro `\ltx@onelevel@sanitize` provides LaTeX's `\@onelevel@sanitize`. The macro is expanded once and the contents is converted to characters with catcode 12 (other) and space tokens with catcode 10 (space). Then then sanitized contents is stored into the macro again. Since version 1.12.

1.13 File management

All macros in this section are expandable like the counterparts of the LaTeX kernel. Also they can be used after the preamble.

1.13.1 File extensions

`\ltx@clsextension`
`\ltx@pkgextension`

Macros `\ltx@clsextension` and `\ltx@styextension` stores the strings `cls` and `sty`. In opposite to LaTeX's `\@clsextension` and `\@styextension` they can also be used after `\begin{document}`.

1.13.2 Load check

`\ltx@ifclassloaded {`⟨*class*⟩`} {`⟨*yes*⟩`} {`⟨*no*⟩`}`
`\ltx@ifpackageloaded {`⟨*package*⟩`} {`⟨*yes*⟩`} {`⟨*no*⟩`}`

Macros `\ltx@ifclassloaded`/`\ltx@ifpackageloaded` execute ⟨*yes*⟩, if the ⟨*class*⟩ or ⟨*package*⟩ is loaded, otherwise ⟨*no*⟩ is called. Both ⟨*class*⟩ and ⟨*package*⟩ are specified without extension. The macros can also be used after `\begin{document}`.

`\ltx@iffileloaded {`⟨*file*⟩`} {`⟨*yes*⟩`} {`⟨*no*⟩`}`

If LaTeX's `\ProvidesFile` macro was called before using ⟨*file*⟩ as argument, then `\ltx@iffileloaded` calls ⟨*yes*⟩, otherwise ⟨*no*⟩. Therefore it is possible that the ⟨*file*⟩ is loaded, but ⟨*no*⟩ is executed because of a missing `\ProvidesFile`. The LaTeX kernel does not have a counterpart of `\ltx@iffileloaded`.

Note that the file name used in `\ProvidesFile` and `\ltx@iffileloaded` must match. For example, if TeX's default extension `.tex` was given in the first command, then it must also specified in the latter command and vice versa.

1.13.3 Version date check

```
\ltx@ifclasslater {⟨class⟩} {⟨date⟩} {⟨yes⟩} {⟨no⟩}
\ltx@ifpackagelater {⟨package⟩} {⟨date⟩} {⟨yes⟩} {⟨no⟩}
\ltx@iffilelater {⟨file⟩} {⟨date⟩} {⟨yes⟩} {⟨no⟩}
```

If a `\ProvidesClass`/`\ProvidesPackage`/`\ProvidesFile` command with exact the same class/package/file was executed before with an optional argument that starts with a LaTeX version date, then this version date is compared with the argument ⟨*date*⟩. If they are equal or if the version date is the later date, then ⟨*yes*⟩ is called. In all other cases ⟨*no*⟩ is executed.

A LaTeX date has the format `YYYY/MM/DD` with `YYYY` as year with four digits, `MM` as month with two digits and `DD` as day with two digits. If pdfTeX's `\pdfmatch` is available, then it is used to detect the version date, to reject invalid date formats and to reject some invalid dates. Dates before 1994/01/01 are always invalid, because version dates are introduced with LaTeX 2_ε in 1994.

1.14 Macro additions

```
\ltx@GlobalAppendToMacro {⟨cmd⟩} {⟨addition⟩}
\ltx@LocalAppendToMacro {⟨cmd⟩} {⟨addition⟩}
```

The ⟨*addition*⟩ is appended to the parameterless macro ⟨*cmd*⟩. If ⟨*cmd*⟩ is undefined or has the meaning `\relax`, then it will be initialized as empty macro beforehand. Due to a bug ⟨*addition*⟩ must not contain `\par` before version 2010/10/25 v1.9.

```
\ltx@GlobalPrependToMacro {⟨cmd⟩} {⟨addition⟩}
\ltx@LocalPrependToMacro {⟨cmd⟩} {⟨addition⟩}
```

The ⟨*addition*⟩ is prepended to the parameterless macro ⟨*cmd*⟩. If ⟨*cmd*⟩ is undefined or has the meaning `\relax`, then it will be initialized as empty macro beforehand. The macros were added in version 2011/08/22 v1.21.

1.15 Next character detection

```
\ltx@ifnextchar {⟨char⟩} {⟨yes⟩} {⟨no⟩}
```

If next character is ⟨*char*⟩ then ⟨*yes*⟩ is called, otherwise ⟨*no*⟩. The character is not removed. Spaces are silently removed when looking for ⟨*char*⟩ as LaTeX's version `\kernel@ifnextchar` does. But there are also small differences:

- The space can be used as ⟨*char*⟩. In this case optional spaces before ⟨*char*⟩ are not supported of course.
- If the optional space is a command that is a character (defined by `\let` or `\futurelet`), then `\kernel@ifnextchar` breaks with an TeX error. `\ltx@ifnextchar` silently removes this token as optional space.

Since 2010/03/01 v1.3.

`\ltx@ifnextchar@nospace {⟨char⟩} {⟨yes⟩} {⟨no⟩}`

Macro `\ltx@ifnextchar@nospace` behaves like macro `\ltx@ifnextchar` with the exception that optional spaces are not supported before ⟨*char*⟩. Since 2011/04/14 v1.19.

1.16 `\ltx@leavevmode`, `\ltx@mbox`

`\ltx@leavevmode`

Macro `\ltx@leavevmode` calls pdfTEX's `\quitvmode`. Otherwise `\leavevmode` is used and defined if it is necessary.

`\ltx@mbox`

Macro `\ltx@mbox` reimplements `\mbox` with two changes. Instead of `\leavevmode` it uses `\ltx@leavevmode` and stops right after `\hbox`. Especially it does not grab the argument and allows the extended syntax of `\hbox`.

1.17 Expandable test for emptiness

`\ltx@ifempty {⟨stuff⟩} {⟨yes⟩} {⟨no⟩}`

Macro `\ltx@ifempty` checks in exact two expansion steps whether ⟨*stuff*⟩ is empty or contains token. Depending on the result ⟨*yes*⟩ or ⟨*no*⟩ is executed. The token in ⟨*stuff*⟩ may contain `\par` and unmatched conditionals (`\if`, `\else`, `\fi`, …). Since version 2010/11/12 v1.11.

`\ltx@ifblank {⟨stuff⟩} {⟨yes⟩} {⟨no⟩}`

Macro `\ltx@ifblank` tests in exact two expansion steps if ⟨*stuff*⟩ is empty or contain only blank spaces. In this case argument ⟨*yes*⟩ is called. If ⟨*stuff*⟩ contains other tokens than spaces then ⟨*no*⟩ is executed. Since version 2010/12/04 v1.13.

1.18 Stripping spaces

`\ltx@zapspace {⟨stuff⟩}`

Macro `\ltx@zapspace` strips spaces from ⟨*stuff*⟩ that are not hidden inside curly braces. Like LATEX's `\zap@space` it is expandable. Differences:

- Syntax: `\zap@space` also expects a space token and `\@empty` after ⟨*stuff*⟩.
- Macro `\ltx@zapspace` is expandable in exact two expansion steps.
- Macro `\ltx@zapspace` always retains curly braces.
- Macro `\zap@space` has a bug. It stops stripping spaces after a token group in curly braces if the first two tokens inside the group are equal.
- Macro `\ltx@zapspace` also works with `\par` and conditionals (`\if`, `\else`, `\fi`, …).

Macro `\ltx@zapspace` is available since version 2010/12/07 v1.14.

1.19 Check for emptiness of boxes

`\ltx@IfBoxEmpty {`⟨*box register number*⟩`} {`⟨*yes*⟩`} {`⟨*no*⟩`}`

Macro `\ltx@IfBoxEmpty` calls ⟨*yes*⟩ if the box exists (`\ifvoid` returns false) and the box does not contain any content. Otherwise if the box is void or contains something, then ⟨*no*⟩ is executed. Thus being empty means that the box exists and is either an `\hbox` or a `\vbox` and may even have dimensions other than 0.0 pt, but the box does not contain anything. Macro `\ltx@IfBoxEmpty` is available since 2010/02/04 v1.16.

`\ltx@IfBoxVoidOrEmpty {`⟨*box register number*⟩`} {`⟨*yes*⟩`} {`⟨*no*⟩`}`

Macro `\ltx@IfBoxVoidOrEmpty` calls ⟨*yes*⟩ if the box is either void or does not contain any content. Otherwise ⟨*no*⟩ is executed. Macro `\ltx@IfBoxVoidOrEmpty` is available since 2010/02/04 v1.16.

2 Implementation

2.1 Identification

1 ⟨*package⟩

Reload check, especially if the package is not used with LaTeX.

```
2 \begingroup\catcode61\catcode48\catcode32=10\relax%
3   \catcode13=5 % ^^M
4   \endlinechar=13 %
5   \catcode35=6 % #
6   \catcode39=12 % '
7   \catcode44=12 % ,
8   \catcode45=12 % -
9   \catcode46=12 % .
10  \catcode58=12 % :
11  \catcode64=11 % @
12  \catcode123=1 % {
13  \catcode125=2 % }
14  \expandafter\let\expandafter\x\csname ver@ltxcmds.sty\endcsname
15  \ifx\x\relax % plain-TeX, first loading
16  \else
17    \def\empty{}%
18    \ifx\x\empty % LaTeX, first loading,
19      % variable is initialized, but \ProvidesPackage not yet seen
20    \else
21      \expandafter\ifx\csname PackageInfo\endcsname\relax
22        \def\x#1#2{%
23          \immediate\write-1{Package #1 Info: #2.}%
24        }%
25      \else
26        \def\x#1#2{\PackageInfo{#1}{#2, stopped}}%
27      \fi
28      \x{ltxcmds}{The package is already loaded}%
29      \aftergroup\endinput
30    \fi
31  \fi
32 \endgroup%
```

Package identification:

```
\begingroup\catcode61\catcode48\catcode32=10\relax%
  \catcode13=5 % ^^M
  \endlinechar=13 %
  \catcode35=6 % #
  \catcode39=12 % '
  \catcode40=12 % (
  \catcode41=12 % )
  \catcode44=12 % ,
  \catcode45=12 % -
  \catcode46=12 % .
  \catcode47=12 % /
  \catcode58=12 % :
  \catcode64=11 % @
  \catcode91=12 % [
  \catcode93=12 % ]
  \catcode123=1 % {
  \catcode125=2 % }
  \expandafter\ifx\csname ProvidesPackage\endcsname\relax
    \def\x#1#2#3[#4]{\endgroup
      \immediate\write-1{Package: #3 #4}%
      \xdef#1{#4}%
    }%
  \else
    \def\x#1#2[#3]{\endgroup
      #2[{#3}]%
      \ifx#1\@undefined
        \xdef#1{#3}%
      \fi
      \ifx#1\relax
        \xdef#1{#3}%
      \fi
    }%
  \fi
\expandafter\x\csname ver@ltxcmds.sty\endcsname
\ProvidesPackage{ltxcmds}%
  [2016/05/16 v1.23 LaTeX kernel commands for general use (HO)]%
\begingroup\catcode61\catcode48\catcode32=10\relax%
  \catcode13=5 % ^^M
  \endlinechar=13 %
  \catcode123=1 % {
  \catcode125=2 % }
  \catcode64=11 % @
  \def\x{\endgroup
    \expandafter\edef\csname LTXcmds@AtEnd\endcsname{%
      \endlinechar=\the\endlinechar\relax
      \catcode13=\the\catcode13\relax
      \catcode32=\the\catcode32\relax
      \catcode35=\the\catcode35\relax
      \catcode61=\the\catcode61\relax
      \catcode64=\the\catcode64\relax
      \catcode123=\the\catcode123\relax
      \catcode125=\the\catcode125\relax
    }%
  }%
\x\catcode61\catcode48\catcode32=10\relax%
\catcode13=5 % ^^M
\endlinechar=13 %
```

```
\catcode35=6 % #
\catcode64=11 % @
\catcode123=1 % {
\catcode125=2 % }
\def\TMP@EnsureCode#1#2{%
  \edef\LTXcmds@AtEnd{%
    \LTXcmds@AtEnd
    \catcode#1=\the\catcode#1\relax
  }%
  \catcode#1=#2\relax
}
\TMP@EnsureCode{36}{3}% $
\TMP@EnsureCode{38}{4}% &
\TMP@EnsureCode{40}{12}% (
\TMP@EnsureCode{41}{12}% )
\TMP@EnsureCode{45}{12}% -
\TMP@EnsureCode{46}{12}% .
\TMP@EnsureCode{47}{12}% /
\TMP@EnsureCode{60}{12}% <
\TMP@EnsureCode{62}{12}% >
\TMP@EnsureCode{91}{12}% [
\TMP@EnsureCode{96}{12}% `
\TMP@EnsureCode{93}{12}% ]
\TMP@EnsureCode{94}{12}% ^ (superscript) (!)
\TMP@EnsureCode{124}{12}% |
\edef\LTXcmds@AtEnd{\LTXcmds@AtEnd\noexpand\endinput}
```

2.2 Numbers

\ltx@zero

```
\chardef\ltx@zero=0 %
```

\ltx@one

```
\chardef\ltx@one=1 %
```

\ltx@two

```
\chardef\ltx@two=2 %
```

\ltx@active

```
\chardef\ltx@active=13 %
```

\ltx@cclv

```
\chardef\ltx@cclv=255 %
```

\ltx@minusone

```
\def\ltx@minusone{%
  -\ltx@one
}
```

2.3 Scratch registers

\ltx@LocToksA

```
\toksdef\ltx@LocToksA=0 %
```

\ltx@LocToksB

```
\toksdef\ltx@LocToksB=2 %
```

```
 \ltx@LocToksC
                126 \toksdef\ltx@LocToksC=4 %
 \ltx@LocToksD
                127 \toksdef\ltx@LocToksD=6 %
 \ltx@LocToksE
                128 \toksdef\ltx@LocToksE=8 %
\ltx@GlobToksA
                129 \toksdef\ltx@GlobToksA=1 %
\ltx@GlobToksB
                130 \toksdef\ltx@GlobToksB=3 %
\ltx@GlobToksC
                131 \toksdef\ltx@GlobToksC=5 %
\ltx@GlobToksD
                132 \toksdef\ltx@GlobToksD=7 %
\ltx@GlobToksE
                133 \toksdef\ltx@GlobToksE=9 %
\ltx@LocDimenA
                134 \dimendef\ltx@LocDimenA=0 %
\ltx@LocDimenB
                135 \dimendef\ltx@LocDimenB=2 %
\ltx@LocDimenC
                136 \dimendef\ltx@LocDimenC=4 %
\ltx@LocDimenD
                137 \dimendef\ltx@LocDimenD=6 %
\ltx@LocDimenE
                138 \dimendef\ltx@LocDimenE=8 %
\ltx@GlobDimenA
                139 \dimendef\ltx@GlobDimenA=1 %
\ltx@GlobDimenB
                140 \dimendef\ltx@GlobDimenB=3 %
\ltx@GlobDimenC
                141 \dimendef\ltx@GlobDimenC=5 %
\ltx@GlobDimenD
                142 \dimendef\ltx@GlobDimenD=7 %
\ltx@GlobDimenE
                143 \dimendef\ltx@GlobDimenE=9 %
 \ltx@LocSkipA
                144 \skipdef\ltx@LocSkipA=0 %
```

```
     \ltx@LocSkipB
                    145 \skipdef\ltx@LocSkipB=2 %
     \ltx@LocSkipC
                    146 \skipdef\ltx@LocSkipC=4 %
     \ltx@LocSkipD
                    147 \skipdef\ltx@LocSkipD=6 %
     \ltx@LocSkipE
                    148 \skipdef\ltx@LocSkipE=8 %
    \ltx@GlobSkipA
                    149 \skipdef\ltx@GlobSkipA=1 %
    \ltx@GlobSkipB
                    150 \skipdef\ltx@GlobSkipB=3 %
    \ltx@GlobSkipC
                    151 \skipdef\ltx@GlobSkipC=5 %
    \ltx@GlobSkipD
                    152 \skipdef\ltx@GlobSkipD=7 %
    \ltx@GlobSkipE
                    153 \skipdef\ltx@GlobSkipE=9 %
```

2.4 Argument killers

```
       \ltx@gobble
                    154 \long\def\ltx@gobble#1{}
    \ltx@gobbletwo
                    155 \long\def\ltx@gobbletwo#1#2{}
  \ltx@gobblethree
                    156 \long\def\ltx@gobblethree#1#2#3{}
   \ltx@gobblefour
                    157 \long\def\ltx@gobblefour#1#2#3#4{}
    \ltx@GobbleNum
                    158 \def\ltx@GobbleNum#1{%
                    159   \romannumeral
                    160   \csname ltx@zero%
                    161   \expandafter\LTXcmds@GobbleNum
                    162   \romannumeral\LTXcmds@num{#1}000{m\endcsname}%
                    163 }
\LTXcmds@GobbleNum
                    164 \def\LTXcmds@GobbleNum#1{%
                    165   \csname LTXcmds@G#1\LTXcmds@GobbleNum
                    166 }
       \LTXcmds@Gm
                    167 \long\def\LTXcmds@Gm#1{%
                    168   \endcsname
                    169 }
```

2.5 Argument grabbers

\ltx@firstofone
```
\long\def\ltx@firstofone#1{#1}
```
\ltx@firstoftwo
```
\long\def\ltx@firstoftwo#1#2{#1}
```
\ltx@secondoftwo
```
\long\def\ltx@secondoftwo#1#2{#2}
```
\ltx@firstofthree
```
\long\def\ltx@firstofthree#1#2#3{#1}
```
\ltx@secondofthree
```
\long\def\ltx@secondofthree#1#2#3{#2}
```
\ltx@thirdofthree
```
\long\def\ltx@thirdofthree#1#2#3{#3}%
```
\ltx@firstoffour
```
\long\def\ltx@firstoffour#1#2#3#4{#1}
```
\ltx@secondoffour
```
\long\def\ltx@secondoffour#1#2#3#4{#2}
```
\ltx@thirdoffour
```
\long\def\ltx@thirdoffour#1#2#3#4{#3}%
```
\ltx@fourthoffour
```
\long\def\ltx@fourthoffour#1#2#3#4{#4}%
```

2.6 List helpers

\ltx@carzero
```
\long\def\ltx@carzero#1\@nil{}%
```
\LTXcmds@cdrzero
```
\long\def\LTXcmds@cdrzero#1\@nil{#1}
```
\ltx@cdrzero
```
\def\ltx@cdrzero{%
  \romannumeral\LTXcmds@cdrzero\ltx@zero
}
```
\ltx@car
```
\long\def\ltx@car#1#2\@nil{#1}
```
\ltx@cdr
```
\long\def\ltx@cdr#1{%
  \romannumeral\LTXcmds@cdrzero\ltx@zero
}
```
\ltx@cartwo
```
\long\def\ltx@cartwo#1#2#3\@nil{#1#2}
```

```
\ltx@carsecond
\long\def\ltx@carsecond#1#2#3\@nil{#2}
\ltx@cdrtwo
\long\def\ltx@cdrtwo#1#2{%
  \romannumeral\LTXcmds@cdrzero\ltx@zero
}
\ltx@carthree
\long\def\ltx@carthree#1#2#3#4\@nil{#1#2#3}
\ltx@carthird
\long\def\ltx@carthird#1#2#3#4\@nil{#3}
\ltx@cdrthree
\long\def\ltx@cdrthree#1#2#3{%
  \romannumeral\LTXcmds@cdrzero\ltx@zero
}
\ltx@carfour
\long\def\ltx@carfour#1#2#3#4#5\@nil{#1#2#3#4}
\ltx@carfourth
\long\def\ltx@carfourth#1#2#3#4#5\@nil{#4}
\ltx@cdrfour
\long\def\ltx@cdrfour#1#2#3#4{%
  \romannumeral\LTXcmds@cdrzero\ltx@zero
}
\ltx@CarNum
\def\ltx@CarNum#1{%
  \romannumeral
  \csname LTXcmds@CarNumFinish%
  \expandafter\LTXcmds@CarNum
  \romannumeral\LTXcmds@num{#1}000{x\endcsname}%
}
\LTXcmds@CarNum
\def\LTXcmds@CarNum#1{%
  \csname LTXcmds@C#1\LTXcmds@CarNum
}
\LTXcmds@Cm
\long\def\LTXcmds@Cm#1#2{%
  \endcsname{#1#2}%
}
\LTXcmds@Cx
\def\LTXcmds@Cx#1{%
  \endcsname{}%
}
\LTXcmds@CarNumFinish
\long\def\LTXcmds@CarNumFinish#1#2\@nil{%
  \ltx@zero
  #1%
}
```

\ltx@CarNumth

```
\def\ltx@CarNumth#1{%
  \romannumeral
  \expandafter\expandafter\expandafter
  \LTXcmds@CarNumth
  \ltx@GobbleNum{#1}{}%
}
```

\LTXcmds@CarNumth

```
\long\def\LTXcmds@CarNumth#1#2\@nil{%
  \ltx@zero
  #1%
}
```

\ltx@CdrNum

```
\def\ltx@CdrNum#1{%
  \romannumeral%
  \expandafter\expandafter\expandafter\ltx@cdrzero
  \expandafter\expandafter\expandafter\ltx@zero
  \ltx@GobbleNum{#1}%
}
```

2.7 Tail recursion

\ltx@ReturnAfterFi

```
\long\def\ltx@ReturnAfterFi#1\fi{\fi#1}
```

\ltx@ReturnAfterElseFi

```
\long\def\ltx@ReturnAfterElseFi#1\else#2\fi{\fi#1}
```

2.8 Empty macro

\ltx@empty

```
\def\ltx@empty{}
```

2.9 Characters

\ltx@space

```
\def\ltx@space{ }
```

\ltx@percentchar

```
\begingroup
  \lccode`0=`\%\relax
\lowercase{\endgroup
  \def\ltx@percentchar{0}%
}
```

\ltx@backslashchar

```
\begingroup
  \lccode`0=`\\\relax
\lowercase{\endgroup
  \def\ltx@backslashchar{0}%
}
```

\ltx@hashchar

```
\begingroup
  \lccode`0=`\#\relax
\lowercase{\endgroup
  \def\ltx@hashchar{0}%
}
```

\ltx@leftbracechar

```
\begingroup
  \lccode`0=`\{\relax
\lowercase{\endgroup
  \def\ltx@leftbracechar{0}%
}
```

\ltx@rightbracechar

```
\begingroup
  \lccode`0=`\}\relax
\lowercase{\endgroup
  \def\ltx@rightbracechar{0}%
}
```

2.10 Boolean switch

\ltx@newif

```
\def\ltx@newif#1{%
  \begingroup
    \escapechar=-1 %
  \expandafter\endgroup
  \expandafter\LTXcmds@newif\string#1\@nil
}
```

\LTXcmds@newif

```
\begingroup
  \escapechar=-1 %
\expandafter\endgroup
\expandafter\def\expandafter\LTXcmds@newif\string\if#1\@nil{%
  \expandafter\edef\csname#1true\endcsname{%
    \let
    \expandafter\noexpand\csname if#1\endcsname
    \noexpand\iftrue
  }%
  \expandafter\edef\csname#1false\endcsname{%
    \let
    \expandafter\noexpand\csname if#1\endcsname
    \noexpand\iffalse
  }%
  \csname#1false\endcsname
}
```

\ltx@newglobalif

```
\def\ltx@newglobalif#1{%
  \begingroup
    \escapechar=-1 %
  \expandafter\endgroup
  \expandafter\LTXcmds@newglobalif\string#1\@nil
}
```

\LTXcmds@newglobalif

```
\begingroup
  \escapechar=-1 %
\expandafter\endgroup
\expandafter
\def\expandafter\LTXcmds@newglobalif\string\if#1\@nil{%
  \expandafter\edef\csname#1true\endcsname{%
    \global\let
    \expandafter\noexpand\csname if#1\endcsname
    \noexpand\iftrue
  }%
  \expandafter\edef\csname#1false\endcsname{%
    \global\let
    \expandafter\noexpand\csname if#1\endcsname
    \noexpand\iffalse
  }%
  \csname#1false\endcsname
}
```

2.11 Command definitions

\ltx@LocalExpandAfter

```
\def\ltx@LocalExpandAfter{%
  \begingroup
    \expandafter\expandafter\expandafter
  \endgroup
  \expandafter
}

\ltx@LocalExpandAfter
\ifx\csname ifcsname\endcsname\relax
```

\ltx@ifundefined

```
  \def\ltx@ifundefined#1{%
    \expandafter\ifx\csname #1\endcsname\relax
      \expandafter\ltx@firstoftwo
    \else
      \expandafter\ltx@secondoftwo
    \fi
  }%
```

\ltx@IfUndefined

```
  \def\ltx@IfUndefined#1{%
    \begingroup\expandafter\expandafter\expandafter\endgroup
    \expandafter\ifx\csname #1\endcsname\relax
      \expandafter\ltx@firstoftwo
    \else
      \expandafter\ltx@secondoftwo
    \fi
  }%

  \expandafter\ltx@gobble
\else
  \expandafter\ltx@firstofone
\fi
{%
```

\ltx@ifundefined

```
\def\ltx@ifundefined#1{%
  \ifcsname #1\endcsname
    \expandafter\ifx\csname #1\endcsname\relax
      \expandafter\expandafter\expandafter\ltx@firstoftwo
    \else
      \expandafter\expandafter\expandafter\ltx@secondoftwo
    \fi
  \else
    \expandafter\ltx@firstoftwo
  \fi
}%
```

\ltx@IfUndefined

```
\let\ltx@IfUndefined\ltx@ifundefined

}
```

2.12 Stripping

\ltx@RemovePrefix

```
\def\ltx@RemovePrefix#1>{}
```

\ltx@StripPrefix

```
\def\ltx@StripPrefix{%
  \expandafter\ltx@RemovePrefix
}
```

\ltx@onelevel@sanitize

```
\def\ltx@onelevel@sanitize#1{%
  \edef#1{%
    \expandafter
    \ltx@RemovePrefix\meaning#1%
  }%
}
```

2.13 File management

2.13.1 File extensions

\ltx@clsextension

```
\def\ltx@clsextension{cls}
```

\ltx@pkgextension

```
\def\ltx@pkgextension{sty}
```

2.13.2 Load check

\ltx@iffileloaded

```
\def\ltx@iffileloaded#1{%
  \ltx@ifundefined{ver@#1}\ltx@secondoftwo\ltx@firstoftwo
}
```

\ltx@ifclassloaded

```
\def\ltx@ifclassloaded#1{%
  \ltx@iffileloaded{#1.\ltx@clsextension}%
}
```

\ltx@ifpackageloaded

```
\def\ltx@ifpackageloaded#1{%
  \ltx@iffileloaded{#1.\ltx@pkgextension}%
}
```

2.13.3 Version date check

\ltx@iffilelater

```
\def\ltx@iffilelater#1#2{%
  \ltx@iffileloaded{#1}{%
    \expandafter\LTXcmds@IfLater\expandafter{%
      \number
      \expandafter\expandafter\expandafter\LTXcmds@ParseVersion
      \expandafter\expandafter\expandafter{%
        \csname ver@#1\endcsname
      }%
    \expandafter}\expandafter{%
      \number
      \expandafter\LTXcmds@ParseVersion\expandafter{#2}%
    }%
  }\ltx@secondoftwo
}
```

\LTXcmds@IfLater

```
\def\LTXcmds@IfLater#1#2{%
  \ifcase 0%
      \ifnum#1<19940101 %
      \else
        \ifnum#2<19940101 %
        \else
          \ifnum#2>#1 %
          \else
            1%
          \fi
        \fi
      \fi
      \ltx@space
    \expandafter\ltx@secondoftwo
  \else
    \expandafter\ltx@firstoftwo
  \fi
}
```

\ltx@ifclasslater

```
\def\ltx@ifclasslater#1{%
  \ltx@iffilelater{#1.\ltx@clsextension}%
}
```

\ltx@ifpackagelater

```
\def\ltx@ifpackagelater#1{%
  \ltx@iffilelater{#1.\ltx@pkgextension}%
}
```

```
\ltx@IfUndefined{pdfmatch}{%
```

\LTXcmds@ParseVersion

```
  \def\LTXcmds@ParseVersion#1{%
    \LTXcmds@@ParseVersion#10000/00/00\@nil
  }%
```

\LTXcmds@@ParseVersion

```
  \def\LTXcmds@@ParseVersion#1#2#3#4/#5#6/#7#8#9\@nil{%
    #1#2#3#4#5#6#7#8%
  }%
}{%
```

\LTXcmds@ParseVersion

```
  \def\LTXcmds@ParseVersion#1{%
    \ifnum\pdfmatch{%
      ^%
      (199[4-9]|[2-9][0-9][0-9][0-9])/%
      (0[1-9]|1[0-2])/%
      (0[1-9]|[1-2][0-9]|3[0-1])%
    }{#1}=1 %
      \ltx@StripPrefix\pdflastmatch1 %
      \ltx@StripPrefix\pdflastmatch2 %
      \ltx@StripPrefix\pdflastmatch3 %
    \else
      0%
    \fi
  }%
}
```

2.14 Macro additions

\ltx@GlobalAppendToMacro

```
\long\def\ltx@GlobalAppendToMacro#1#2{%
  \ifx\ltx@undefined#1%
    \let#1\ltx@empty
  \else
    \ifx\relax#1%
      \let#1\ltx@empty
    \fi
  \fi
  \begingroup
    \ltx@LocToksA\expandafter{#1#2}%
    \xdef#1{\the\ltx@LocToksA}%
  \endgroup
}
```

\ltx@LocalAppendToMacro

```
\long\def\ltx@LocalAppendToMacro#1#2{%
  \global\let\LTXcmds@gtemp#1%
  \ifx\ltx@undefined\LTXcmds@gtemp
    \global\let\LTXcmds@gtemp\ltx@empty
  \else
    \ifx\relax\LTXcmds@gtemp
      \global\letLTXcmds@gtemp\ltx@empty
    \fi
  \fi
  \begingroup
    \ltx@LocToksA\expandafter{\LTXcmds@gtemp#2}%
    \xdef\LTXcmds@gtemp{\the\ltx@LocToksA}%
  \endgroup
  \let#1\LTXcmds@gtemp
}
```

\ltx@GlobalPrependToMacro

```
\long\def\ltx@GlobalPrependToMacro#1#2{%
  \ifx\ltx@undefined#1%
    \let#1\ltx@empty
  \else
    \ifx\relax#1%
      \let#1\ltx@empty
    \fi
  \fi
  \begingroup
    \ltx@LocToksA{#2}%
    \ltx@LocToksB\expandafter{#1}%
    \xdef#1{\the\ltx@LocToksA\the\ltx@LocToksB}%
  \endgroup
}
```

\ltx@LocalPrependToMacro

```
\long\def\ltx@LocalPrependToMacro#1#2{%
  \global\let\LTXcmds@gtemp#1%
  \ifx\ltx@undefined\LTXcmds@gtemp
    \global\let\LTXcmds@gtemp\ltx@empty
  \else
    \ifx\relax\LTXcmds@gtemp
      \global\letLTXcmds@gtemp\ltx@empty
    \fi
  \fi
  \begingroup
    \ltx@LocToksA{#2}%
    \ltx@LocToksB\expandafter{\LTXcmds@gtemp}%
    \xdef\LTXcmds@gtemp{\the\ltx@LocToksA\the\ltx@LocToksB}%
  \endgroup
  \let#1\LTXcmds@gtemp
}
```

2.15 Next character detection

\ltx@ifnextchar

```
\long\def\ltx@ifnextchar#1#2#3{%
  \begingroup
  \let\LTXcmds@CharToken= #1\relax
  \ltx@LocToksA{\endgroup#2}%
  \ltx@LocToksB{\endgroup#3}%
  \futurelet\LTXcmds@LetToken\LTXcmds@ifnextchar
}
```

\LTXcmds@ifnextchar

```
\def\LTXcmds@ifnextchar{%
  \ifx\LTXcmds@LetToken\LTXcmds@CharToken
    \the\expandafter\ltx@LocToksA
  \else
    \expandafter
      \ifx\csname LTXcmds@LetToken\endcsname\LTXcmds@SpaceToken
      \expandafter\expandafter\expandafter\LTXcmds@@ifnextchar
    \else
      \the\expandafter\expandafter\expandafter\ltx@LocToksB
    \fi
  \fi
}
```

\LTXcmds@@ifnextchar

\futurelet does not distinguish between a character and a command that is a character (defined by using \let or \futurelet). Therefore the space is catched by \romannumeral with negative character constant that gobbles one optional space.

```
\def\LTXcmds@@ifnextchar{%
  \expandafter\futurelet
  \expandafter\LTXcmds@LetToken
  \expandafter\LTXcmds@ifnextchar
  \romannumeral-`\.%
}
```

\LTXcmds@SpaceToken

```
\ltx@firstofone{\let\LTXcmds@SpaceToken= } %
```

\ltx@ifnextchar@nospace

```
\long\def\ltx@ifnextchar@nospace#1#2#3{%
  \begingroup
  \let\LTXcmds@CharToken= #1\relax
  \ltx@LocToksA{\endgroup#2}%
  \ltx@LocToksB{\endgroup#3}%
  \futurelet\LTXcmds@LetToken\LTXcmds@ifnextchar@nospace
}
```

\LTXcmds@ifnextchar@nospace

```
\def\LTXcmds@ifnextchar@nospace{%
  \the
  \ifx\LTXcmds@LetToken\LTXcmds@CharToken
    \expandafter\ltx@LocToksA
  \else
    \expandafter\ltx@LocToksB
  \fi
}
```

2.16 \ltx@leavevmode, \ltx@mbox

\ltx@leavevmode

```
\ltx@IfUndefined{quitvmode}{%
  \ltx@IfUndefined{leavevmode}{%
    \ltx@IfUndefined{voidb@x}{%
      \ltx@IfUndefined{newbox}{%
        \def\ltx@leavevmode{%
          \begingroup
            \setbox\ltx@zero=\hbox{}%
            \begingroup
              \setbox\ltx@zero=\hbox{\box\ltx@zero}%
            \endgroup
            \unhbox\ltx@zero
          \endgroup
        }%
      }{%
        \csname newbox\endcsname\LTXcmds@VoidBox
        \ifvoid\LTXcmds@VoidBox
        \else
          \setbox\LTXcmds@VoidBox=\hbox{}%
          \begingroup
            \setbox\LTXcmds@VoidBox=\hbox{\box\LTXcmds@VoidBox}%
          \endgroup
```

```
        \fi
        \def\ltx@leavevmode{\unhbox\LTXcmds@VoidBox}%
      }%
    }{%
      \def\ltx@leavevmode{\unhbox\voidb@x}%
    }%
  }{%
    \let\ltx@leavevmode\leavevmode
  }%
}{%
  \let\ltx@leavevmode\quitvmode
}
```

\ltx@mbox

```
\def\ltx@mbox{%
  \ltx@leavevmode
  \hbox
}
```

2.17 Help macros

\LTXcmds@num

```
\ltx@IfUndefined{numexpr}{%
  \def\LTXcmds@num#1{%
    \expandafter\ltx@firstofone\expandafter{%
      \number#1%
    }%
  }%
}{%
  \def\LTXcmds@num#1{%
    \expandafter\ltx@firstofone\expandafter{%
      \the\numexpr#1%
    }%
  }%
}
```

2.18 Expandable test for emptiness

```
\ltx@IfUndefined{detokenize}{%
```

2.18.1 Vanilla TEX

\ltx@ifempty

The macro is based on `\@ifempty` of Robert R. Schneck [1] and `\@ifnull` of Ulrich Diez [2]. There are three cases to consider:

1. `#1` is empty,
2. `#1` is not empty and the first token is not a begingroup character,
3. `#1` starts with a begingroup character (catcode 1).

```
  \def\LTXcmds@temp#1{%
    \long\def\ltx@ifempty##1{%
      \romannumeral0%
      \iffalse{\fi
        \expandafter\ltx@gobble\expandafter{%
          \expandafter{\string##1}%
          \expandafter\ltx@gobble\string
        }%
        \expandafter\ltx@firstofthree\expandafter
        {\iffalse}\fi
        \expandafter#1\ltx@secondoftwo
```

```
      }%
      \expandafter#1\ltx@firstoftwo
    }%
```

`\ltx@ifblank`

```
    \long\def\ltx@ifblank##1{%
      \romannumeral0%
      \iffalse{\fi
        \expandafter\expandafter\expandafter\ltx@gobble
        \expandafter\expandafter\expandafter{%
          \expandafter\expandafter\expandafter{%
            \expandafter\string\ltx@gobble##1.%
          }%
          \expandafter\ltx@gobble\string
        }%
        \expandafter\ltx@firstofthree\expandafter
        {\iffalse}\fi
        \expandafter#1\ltx@secondoftwo
      }%
      \expandafter#1\ltx@firstoftwo
    }%
  }%
  \LTXcmds@temp{ }%
}{%
```

2.18.2 With `\detokenize`

Ahmed Musa provided `\ifstrempty` using `\detokenize` and `\pdfstrcmp` [3]. Ulrich Diez, GL, Heiko Oberdiek improved it further by removing `\pdfstrcmp` and taking three arguments [4, 5, 6, 7, 8].

`\ltx@ifempty`

```
  \long\def\ltx@ifempty#1{%
    \romannumeral%
    \csname
      LTXcmds@ifempty%
      \ifcat$\detokenize{#1}$%
        @%
      \fi
    \endcsname
  }%
```

`\LTXcmds@ifempty@`

```
  \long\def\LTXcmds@ifempty@#1#2{0 #1}%
```

`\LTXcmds@ifempty`

```
  \long\def\LTXcmds@ifempty#1#2{0 #2}%
```

2.18.3 `\ltx@ifblank`

`\ltx@ifblank`

```
  \long\def\ltx@ifblank#1{%
    \romannumeral%
    \csname
      LTXcmds@ifempty%
      \ifcat$\detokenize\expandafter{\ltx@gobble#1.}$%
```

```
        @%
      \fi
    \endcsname
  }%

}
```

2.19 \ltx@zapspace

\ltx@zapspace

```
\long\def\ltx@zapspace#1{%
  \romannumeral
  \LTXcmds@zapspace\ltx@zero#1 \@nil
}
```

\LTXcmds@zapspace

```
\long\def\LTXcmds@zapspace#1 #2\@nil{%
  \ltx@ifempty{#2}{%
    #1%
  }{%
    \LTXcmds@zapspace#1#2\@nil
  }%
}
```

2.20 \ltx@IfBoxEmpty

In case of ε-TEX the test for an empty box is done via `\lastnodetype` as suggested by David Kastrup [9].

```
\ltx@IfUndefined{lastnodetype}{%
  \catcode`\$=9 %
  \catcode`\&=14 %
}{%
  \catcode`\$=14 %
  \catcode`\&=9 %
}
```

\ltx@IfBoxEmpty

```
\def\ltx@IfBoxEmpty#1{%
  \ifvoid#1\relax
    \expandafter\ltx@secondoftwo
  \else
```

Implementation using ε-TEX's `\lastnodetype`.

```
&   \begingroup
&     \setbox\ltx@zero=\ifhbox#1\hbox\else\vbox\fi{%
&       \ifhmode\unhcopy\else\unvcopy\fi#1\relax
&       \expandafter
&     }%
&   \expandafter\endgroup
&   \ifnum\lastnodetype<\ltx@zero
&     \expandafter\expandafter\expandafter\ltx@firstoftwo
&   \else
&     \expandafter\expandafter\expandafter\ltx@secondoftwo
&   \fi
```

Implementation without ε-TEX using a signature at the beginning of the test box.

```
$   \begingroup
$     \setbox\ltx@zero=\ifhbox#1\hbox\else\vbox\fi{%
```

```
$       \penalty\ltx@one
$       \ifhmode\unhcopy\else\unvcopy\fi#1\relax
$       \expandafter
$     }%
$     \ifnum\lastpenalty=\ltx@one
```

Box 0 has been changed and is restored by closing the group.

```
$       \endgroup
$       \begingroup
$       \setbox\ltx@zero=\ifhbox#1\hbox\else\vbox\fi{%
$         \penalty\ltx@two
$         \ifhmode\unhcopy\else\unvcopy\fi#1\relax
$         \expandafter
$       }%
$       \ifnum\lastpenalty=\ltx@two
$         \def\next{\endgroup\expandafter\ltx@firstoftwo}%
$       \else
$         \def\next{\endgroup\expandafter\ltx@secondoftwo}%
$       \fi
$     \else
$       \def\next{\endgroup\expandafter\ltx@secondoftwo}%
$     \fi
$   \next
  \fi
}
```

`\ltx@IfBoxVoidOrEmpty`

```
\def\ltx@IfBoxVoidOrEmpty#1{%
  \ifvoid#1\relax
    \expandafter\ltx@thirdoffour
  \fi
  \ltx@IfBoxEmpty{#1}%
}

\LTXcmds@AtEnd%
⟨/package⟩
```

3 Test

3.1 Catcode checks for loading

```
⟨*test1⟩
\catcode`\{=1 %
\catcode`\}=2 %
\catcode`\#=6 %
\catcode`\@=11 %
\expandafter\ifx\csname count@\endcsname\relax
  \countdef\count@=255 %
\fi
\expandafter\ifx\csname @gobble\endcsname\relax
  \long\def\@gobble#1{}%
\fi
\expandafter\ifx\csname @firstofone\endcsname\relax
  \long\def\@firstofone#1{#1}%
\fi
\expandafter\ifx\csname loop\endcsname\relax
  \expandafter\@firstofone
\else
```

```
  \expandafter\@gobble
\fi
{%
  \def\loop#1\repeat{%
    \def\body{#1}%
    \iterate
  }%
  \def\iterate{%
    \body
      \let\next\iterate
    \else
      \let\next\relax
    \fi
    \next
  }%
  \let\repeat=\fi
}%
\def\RestoreCatcodes{}
\count@=0 %
\loop
  \edef\RestoreCatcodes{%
    \RestoreCatcodes
    \catcode\the\count@=\the\catcode\count@\relax
  }%
\ifnum\count@<255 %
  \advance\count@ 1 %
\repeat

\def\RangeCatcodeInvalid#1#2{%
  \count@=#1\relax
  \loop
    \catcode\count@=15 %
  \ifnum\count@<#2\relax
    \advance\count@ 1 %
  \repeat
}
\def\RangeCatcodeCheck#1#2#3{%
  \count@=#1\relax
  \loop
    \ifnum#3=\catcode\count@
    \else
      \errmessage{%
        Character \the\count@\space
        with wrong catcode \the\catcode\count@\space
        instead of \number#3%
      }%
    \fi
  \ifnum\count@<#2\relax
    \advance\count@ 1 %
  \repeat
}
\def\space{ }
\expandafter\ifx\csname LoadCommand\endcsname\relax
  \def\LoadCommand{\input ltxcmds.sty\relax}%
\fi
\def\Test{%
  \RangeCatcodeInvalid{0}{47}%
  \RangeCatcodeInvalid{58}{64}%
```

```
  \RangeCatcodeInvalid{91}{96}%
  \RangeCatcodeInvalid{123}{255}%
  \catcode`\@=12 %
  \catcode`\\=0 %
  \catcode`\%=14 %
  \LoadCommand
  \RangeCatcodeCheck{0}{36}{15}%
  \RangeCatcodeCheck{37}{37}{14}%
  \RangeCatcodeCheck{38}{47}{15}%
  \RangeCatcodeCheck{48}{57}{12}%
  \RangeCatcodeCheck{58}{63}{15}%
  \RangeCatcodeCheck{64}{64}{12}%
  \RangeCatcodeCheck{65}{90}{11}%
  \RangeCatcodeCheck{91}{91}{15}%
  \RangeCatcodeCheck{92}{92}{0}%
  \RangeCatcodeCheck{93}{96}{15}%
  \RangeCatcodeCheck{97}{122}{11}%
  \RangeCatcodeCheck{123}{255}{15}%
  \RestoreCatcodes
}
\Test
\csname @@end\endcsname
\end
```

⟨/test1⟩

3.2 Test `\ltx@GobbleNum`

```
⟨*test-gobble⟩
\catcode`\{=1 %
\catcode`\}=2 %
\catcode`\#=6 %
\expandafter\ifx\csname RequirePackage\endcsname\relax
  \input ltxcmds.sty\relax
\else
  \RequirePackage{ltxcmds}[2016/05/16]%
\fi
\catcode`\@=11 %
\def\msg#{\immediate\write16}%
\msg{[Test \string\ltx@GobbleNum]}%
\long\def\Test#1=#2\\{%
  \edef\StrA{\ltx@GobbleNum#1}%
  \expandafter\expandafter\expandafter\def
  \expandafter\expandafter\expandafter\StrAA
  \expandafter\expandafter\expandafter{\ltx@GobbleNum#1}%
  \edef\StrB{#2}%
  \ifx\StrA\StrB
    \ifx\StrAA\StrB
      \msg{* ok.}%
    \else
      \msg{StrAA: \StrAA}%
      \msg{StrB: \StrB}%
      \errhelp{Test: #1=#2}%
      \errmessage{Test (two expansions) failed}%
    \fi
  \else
    \msg{StrA: \StrA}%
    \msg{StrB: \StrB}%
    \errhelp{Test: #1=#2}%
    \errmessage{Test (edef) failed!}%
```

```
  \fi
}
\Test0abc=abc\\
\Test1abc=bc\\
\Test2abc=c\\
\Test3abcd=d\\
\Test4abcde=e\\
\Test5abcdef=f\\
\Test6abcdefg=g\\
\Test7abcdefgh=h\\
\Test8abcdefghi=i\\
\Test9abcdefghij=j\\
\Test{10}0123456789X=X\\
\Test{12}abcdefghijklm=m\\
\Test{700}%
01234567890123456789012345678901234567890123456789012345678901234567890123456789%
01234567890123456789012345678901234567890123456789012345678901234567890123456789%
01234567890123456789012345678901234567890123456789012345678901234567890123456789%
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01234567890123456789012345678901234567890123456789012345678901234567890123456789%
01234567890123456789012345678901234567890123456789012345678901234567890123456789%
X=X\\
\Test{-1}abc=abc\\
\Test2\par\par\relax=\relax\\

\begingroup
  \count1=2 %
  \Test{\count1}abc=c\\%
\endgroup

\ltx@IfUndefined{numexpr}{%
}{%
  \Test{1+1}abc=c\\%
}

\msg{[Test \string\ltx@CdrNum]}%
\long\def\Test#1=#2\\{%
  \edef\StrA{\ltx@CdrNum#1\@nil}%
  \expandafter\expandafter\expandafter\def
  \expandafter\expandafter\expandafter\StrAA
  \expandafter\expandafter\expandafter{\ltx@CdrNum#1\@nil}%
  \edef\StrB{#2}%
  \ifx\StrA\StrB
    \ifx\StrAA\StrB
      \msg{* ok.}%
    \else
      \msg{StrAA: \meaning\StrAA}%
      \msg{StrB: \meaning\StrB}%
      \errhelp{Test: #1=#2}%
      \errmessage{Test (two expansions) failed}%
    \fi
  \else
    \msg{StrA: \StrA}%
    \msg{StrB: \StrB}%
```

```
    \errhelp{Test: #1=#2}%
    \errmessage{Test (edef) failed!}%
  \fi
}
\Test0abc=abc\\
\Test1abc=bc\\
\Test2abc=c\\
\Test3abcd=d\\
\Test4abcde=e\\
\Test5abcdef=f\\
\Test6abcdefg=g\\
\Test7abcdefgh=h\\
\Test8abcdefghi=i\\
\Test9abcdefghij=j\\
\Test{10}0123456789X=X\\
\Test{12}abcdefghijklm=m\\
\Test{700}%
01234567890123456789012345678901234567890123456789012345678901234567890123456789%
01234567890123456789012345678901234567890123456789012345678901234567890123456789%
01234567890123456789012345678901234567890123456789012345678901234567890123456789%
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01234567890123456789012345678901234567890123456789012345678901234567890123456789%
01234567890123456789012345678901234567890123456789012345678901234567890123456789%
X=X\\
\Test{-1}abc=abc\\
\Test2\par\par\relax=\relax\\

\msg{[Test \string\ltx@CarNum]}%
\long\def\Test#1=#2\\{%
  \edef\StrA{\ltx@CarNum#1\@nil}%
  \expandafter\expandafter\expandafter\def
  \expandafter\expandafter\expandafter\StrAA
  \expandafter\expandafter\expandafter{\ltx@CarNum#1\@nil}%
  \edef\StrB{#2}%
  \ifx\StrA\StrB
    \ifx\StrAA\StrB
      \msg{* ok.}%
    \else
      \msg{StrAA: \meaning\StrAA}%
      \msg{StrB: \meaning\StrB}%
      \errhelp{Test: #1=#2}%
      \errmessage{Test (two expansions) failed}%
    \fi
  \else
    \msg{StrA: \StrA}%
    \msg{StrB: \StrB}%
    \errhelp{Test: #1=#2}%
    \errmessage{Test (edef) failed!}%
  \fi
}
\Test0abc=\\
\Test1abc=a\\
\Test2abc=ab\\
\Test3abc=abc\\
```

```
\Test3abcd=abc\\
\Test4abcde=abcd\\
\Test{10}0123456789X=0123456789\\
\Test{12}abcdefghijklm=abcdefghijkl\\
\Test{700}%
0123456789012345678901234567890123456789012345678901234567890123456789%
0123456789012345678901234567890123456789012345678901234567890123456789%
0123456789012345678901234567890123456789012345678901234567890123456789%
0123456789012345678901234567890123456789012345678901234567890123456789%
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0123456789012345678901234567890123456789012345678901234567890123456789%
0123456789012345678901234567890123456789012345678901234567890123456789%
X=%
0123456789012345678901234567890123456789012345678901234567890123456789%
0123456789012345678901234567890123456789012345678901234567890123456789%
0123456789012345678901234567890123456789012345678901234567890123456789%
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0123456789012345678901234567890123456789012345678901234567890123456789%
0123456789012345678901234567890123456789012345678901234567890123456789%
0123456789012345678901234567890123456789012345678901234567890123456789%
\\
\Test{-1}abc=\\
\Test2\par\par\relax=\par\par\\
\csname @@end\endcsname\end
```
⟨/test-gobble⟩

3.3 Test `\ltx@ifempty`

```
⟨*test-ifempty⟩
\catcode`\{=1 %
\catcode`\}=2 %
\catcode`\#=6 %
\catcode`\@=11 %
\errorcontextlines=1000 %
\begingroup\expandafter\expandafter\expandafter\endgroup
\expandafter\ifx\csname RequirePackage\endcsname\relax
  \input ltxcmds.sty\relax
\else
  \RequirePackage{ltxcmds}[2016/05/16]%
\fi
\def\msg#{\immediate\write16}
\def\TestY{\Y}
\def\TestN{\N}
\msg{* \string\ltx@ifempty}
\long\def\test#1{%
  \begingroup
    % Calculate expected test result via macro definition
    \def\Stuff{#1}%
    \ifx\Stuff\ltx@empty
      \def\StuffEmpty{\Y}%
    \else
      \def\StuffEmpty{\N}%
    \fi
```

```
    % Test \ltx@ifempty
    \expandafter\expandafter\expandafter\def
    \expandafter\expandafter\expandafter\TestEmpty
    \expandafter\expandafter\expandafter{%
      \ltx@ifempty{#1}{\Y}{\N}%
    }%
    \ifx\StuffEmpty\TestEmpty
      \msg{* Test OK}%
    \else
      \ltx@IfUndefined{detokenize}{}{%
        \msg{Stuff: [\detokenize{\Stuff}]}%
      }%
      \errmessage{Test failed!}%
    \fi
  \endgroup
}
\test{}
\test{a}
\test{abc}
\test{\par}
\test{ }
\test{\if}
\test{{\if}}
\test{\else}
\test{{\else}}
\test{\fi}
\test{{}\fi}
\test{\or\ifcase}
\test{{}}
\test{{a}}
\test{{}abc}
\test{{\par}}
\test{{}\par}
\def\SpaceTwo#1{%
  \def\SpaceTwo{#1#1}%
}\SpaceTwo{ }
\msg{* \string\ltx@ifblank}
\long\def\test#1{%
  \begingroup
    % Calculate expected test result via macro definition
    \def\Stuff{#1}%
    \ifx\Stuff\ltx@empty
      \def\StuffEmpty{\Y}%
    \else
      \ifx\Stuff\ltx@space
        \def\StuffEmpty{\Y}%
      \else
        \ifx\Stuff\SpaceTwo
          \def\StuffEmpty{\Y}%
        \else
          \def\StuffEmpty{\N}%
        \fi
      \fi
    \fi
    % Test \ltx@ifblank
    \expandafter\expandafter\expandafter\def
    \expandafter\expandafter\expandafter\TestEmpty
    \expandafter\expandafter\expandafter{%
```

```
      \ltx@ifblank{#1}{\Y}{\N}%
    }%
    \ifx\StuffEmpty\TestEmpty
      \msg{* Test OK}%
    \else
      \ltx@IfUndefined{detokenize}{}{%
        \msg{Stuff: [\detokenize{\Stuff}]}%
      }%
      \errmessage{Test failed!}%
    \fi
  \endgroup
}
\test{}
\test{a}
\test{\if}
\test{\else}
\test{\fi}
\test{ \fi}
\test{\par}
\test{ \par}
\test{{}}
\test{ {}}
\def\x#1{%
  \test{#1#1}%
  \test{#1#1{}}%
  \test{#1#1\par}%
  \test{#1#1\else}%
}\x{ }
\csname @@end\endcsname\end
```
⟨/test-ifempty⟩

3.4 Test \ltx@zap@space

```
⟨*test-zapspace⟩
\catcode`\{=1 %
\catcode`\}=2 %
\catcode`\#=6 %
\catcode`\@=11 %
\errorcontextlines=1000 %
\begingroup\expandafter\expandafter\expandafter\endgroup
\expandafter\ifx\csname RequirePackage\endcsname\relax
  \input ltxcmds.sty\relax
\else
  \RequirePackage{ltxcmds}[2016/05/16]%
\fi
\def\msg#{\immediate\write16}
\def\space{ }
\def\empty{}
\msg{* \string\ltx@zapspace}
\long\def\test#1#2{%
  \begingroup
    \def\TestInput{#1}%
    \def\TestExpected{#2}%
    % Test \ltx@zapspace
    \expandafter\expandafter\expandafter\def
    \expandafter\expandafter\expandafter\TestResult
    \expandafter\expandafter\expandafter{%
      \ltx@zapspace{#1}%
    }%
```

```
    \ifx\TestResult\TestExpected
      \msg{* Test OK}%
    \else
      \ltx@onelevel@sanitize\TestInput
      \ltx@onelevel@sanitize\TestExpected
      \ltx@onelevel@sanitize\TestResult
      \msg{* Input: \space\space\space[\TestInput]}%
      \msg{ \space Result: \space\space[\TestResult]}%
      \msg{ \space Expected: [\TestExpected]}%
      \errmessage{Test failed!}%
    \fi
  \endgroup
}
\long\def\etest#1#2{%
  \begingroup
    \edef\x{\endgroup
      \noexpand\test{#1}{#2}%
    }%
  \x
}
\catcode`\~=13 %
\let~\noexpand

\test{}{}
\test{{}}{{}}
\test{ {}}{{}}
\test{{ }}{{ }}
\test{{} }{{}}
\test{ {} }{{}}
\test{ { } }{{ }}
\test{a {b} c}{a{b}c}
\test{a bb ccc}{abbccc}
\test{{a} {bb} {ccc}}{{a}{bb}{ccc}}
\test{\par}{\par}
\test{\if}{\if}
\test{\space}{\space}
\etest{\par\space\par}{\par\par}
\etest{~\empty\space~\empty}{~\empty~\empty}
\etest{~\fi\space~\else\space}{~\fi~\else}

\csname @@end\endcsname\end
⟨/test-zapspace⟩
```

3.5 Test `\ltx@IfBoxEmpty`

```
⟨*test-ifboxempty⟩
\catcode`\{=1 %
\catcode`\}=2 %
\catcode`\#=6 %
\catcode`\@=11 %
\begingroup\expandafter\expandafter\expandafter\endgroup
\expandafter\ifx\csname RequirePackage\endcsname\relax
  \input ltxcmds.sty\relax
\else
  \RequirePackage{ltxcmds}[2016/05/16]%
\fi
\def\msg#{\immediate\write16}
 % make box 0 void
\begingroup
  \setbox0=\box0 %
```

```
\endgroup
\ifvoid0 %
\else
  \errmessage{Voiding box 0 failed}%
\fi
\setbox2=\box0 %
\def\test#1#2{%
  \@test{#1}{#2}%
  \@@test{#1}{#2}%
  \chardef\x=#1%
  \@test\x{#2}%
  \@@test\x{#2}%
}
\def\@test#1#2{%
  \begingroup
    \setbox9=\hbox{%
      \def\TestExpected{#2}%
      \ltx@IfBoxEmpty{#1}{%
        \def\TestResult{Y}%
      }{%
        \def\TestResult{N}%
      }%
      \ifx\TestExpected\TestResult
        \msg{* Test passed.}%
      \else
        \errmessage{Test failed!}%
      \fi
    }%
    \ifdim\wd9=0pt %
    \else
      \errmessage{Unwanted space?}%
    \fi
  \endgroup
}
\def\@@test#1#2{%
  \begingroup
    \setbox9=\hbox{%
      \def\TestExpected{#2}%
      \ifvoid#1\def\TestExpected{Y}\fi
      \ltx@IfBoxVoidOrEmpty{#1}{%
        \def\TestResult{Y}%
      }{%
        \def\TestResult{N}%
      }%
      \ifx\TestExpected\TestResult
        \msg{* Test passed.}%
      \else
        \errmessage{Test failed!}%
      \fi
    }%
    \ifdim\wd9=0pt %
    \else
      \errmessage{Unwanted space?}%
    \fi
  \endgroup
}
\test0N
\test2N
```

```
\setbox0=\hbox{}
\test0Y
\setbox2=\hbox{}
\test2Y
\setbox0=\vbox{}
\test0Y
\setbox2=\vbox{}
\test0Y
\setbox0=\hbox{ }%
\test0N
\setbox2=\hbox{ }%
\test2N
\setbox0=\hbox{\penalty1}%
\test0N
\setbox2=\hbox{\penalty1}%
\test2N
\csname @@end\endcsname\end
```
⟨/test-ifboxempty⟩

3.6 Test for next character detection

⟨*test-nextchar⟩
```
\catcode`\{=1 %
\catcode`\}=2 %
\catcode`\#=6 %
\catcode`\@=11 %
\begingroup\expandafter\expandafter\expandafter\endgroup
\expandafter\ifx\csname RequirePackage\endcsname\relax
  \input ltxcmds.sty\relax
  \input eolgrab.sty\relax
\else
  \RequirePackage{ltxcmds}[2016/05/16]%
  \RequirePackage{eolgrab}[2011/01/12]%
\fi
\def\msg#{\immediate\write16}
\begingroup
  \def\x#1{%
    \endgroup
    \let\TestSpaceToken= #1\relax
  }%
\x{ }
\def\TestSpace{ }
\begingroup
  \lccode32=65 % space -> A
\lowercase{%
  \endgroup
  \def\TestSpaceA{ }%
}
\def\TestCatch{%
  \eolgrab\@TestCatch
}
\def\@TestCatch#1{%
  \begingroup
    \def\x{#1}%
    \ifx\x\ltx@empty
    \else
      \ltx@onelevel@sanitize\x
      \errmessage{Unparsed stuff on line [\x]}%
    \fi
```

```
  \endgroup
}
\def\TestCmdM#1{%
  \TestCheckType{M}%
  \TestCatch
}
\def\TestCmdOM[#1]#2{%
  \TestCheckType{O}%
  \TestCatch
}
\def\TestCheckType#1{%
  \if\TestCmdType#1\relax
  \else
    \errmessage{Wrong type #1, expected: \TestCmdType}%
  \fi
}
\def\TestCmd#1{%
  \def\TestCmdType{#1}%
  \ltx@ifnextchar[\TestCmdOM\TestCmdM
}
\def\TestCmdExp#1{%
  \expandafter\TestCmd\expandafter#1%
}
\outer\def\TestOuter{}
\TestCmd O[o]{m}
\TestCmd M{m}
\TestCmd O [o]{m}
\TestCmd M {m}
\def\x#1{\def\x{#1#1}}\x{ }
\TestCmdExp O\x[o]{m}
\TestCmdExp M\x{m}
\def\x#1{\def\x{#1#1#1#1}}\x{ }
\TestCmdExp O\x[o]{m}
\TestCmdExp M\x{m}
\def\x{\TestSpaceToken}
\TestCmdExp O\x[o]{m}
\TestCmdExp M\x{m}
\def\x{\TestSpaceToken\TestSpaceToken\TestSpaceToken}
\TestCmdExp O\x[o]{m}
\TestCmdExp M\x{m}
\TestCmd M\TestSpace
\TestOuter
\TestCmd M \TestSpace
\TestOuter
\TestCmd M\iftrue
\TestOuter
\TestCmd M\iffalse
\TestOuter
\TestCmd M\else
\TestOuter
\TestCmd M\fi
\TestOuter
\TestCmd M \iftrue
\TestOuter
\TestCmd M \iffalse
\TestOuter
\TestCmd M \else
\TestOuter
```

```
%
\def\TestCmd#1{%
  \def\TestCmdType{#1}%
  \ltx@ifnextchar@nospace[\TestCmdOM\TestCmdM
}
\TestCmd O[o]{m}
\TestCmd M{m}
\TestCmd M [
\TestOuter
\TestCmd M {m}
\TestCmd M\iftrue
\TestOuter
\TestCmd M\iffalse
\TestOuter
\TestCmd M\else
\TestCmd M\fi
\TestOuter
\TestOuter
%
\def\TestCmd#1{%
  \def\TestCmdType{#1}%
  \ltx@ifnextchar(\TestCmdPM\TestCmdM
}
\def\TestCmdPM(#1)#2{%
  \TestCheckType{P}%
  \TestCatch
}
\TestCmd P(p){m}
\TestCmd M{m}
\TestCmd P (p){m}
\TestCmd M {m}
%
\def\TestCmd#1{%
  \def\TestCmdType{#1}%
  \ltx@ifnextchar{ }\TestCmdSM\TestCmdM
}
\def\TestCmdSM#1#{%
  \TestCheckType{S}%
  \begingroup
    \let\x= #1\relax
    \ifx\x\TestSpaceToken
    \else
      \errmessage{unexpected space token: \meaning#1}%
    \fi
  \endgroup
  \def\TestCmdType{M}%
  \TestCmdM
}
\TestCmd S {m}
\TestCmd M{m}
\def\x#1{\def\x{#1#1}}\x{ }
\TestCmdExp S\x{m}
%
\def\TestCmd#1{%
  \def\TestCmdType{#1}%
  \ltx@ifnextchar\iffalse\TestCmdIM\TestCmdM
}
\def\TestCmdIM\iffalse#1{%
```

```
  \TestCheckType{I}%
  \TestCatch
}
\TestCmd M\iftrue
\TestOuter
\TestCmd M \iftrue
\TestCmd I\iffalse\iffalse
\TestCmd I \iffalse\iffalse
\TestOuter
%
\def\TestCmd#1{%
  \def\TestCmdType{#1}%
  \ltx@ifnextchar@nospace\iffalse\TestCmdIM\TestCmdM
}
\TestCmd M\iftrue
\TestOuter
\TestCmd I\iffalse\iffalse
\TestOuter
\csname @@end\endcsname\end
```
⟨/test-nextchar⟩

3.7 Test for list helpers

```
⟨*test-carcdr⟩
\catcode`\{=1 %
\catcode`\}=2 %
\catcode`\#=6 %
\catcode`\@=11 %
\begingroup\expandafter\expandafter\expandafter\endgroup
\expandafter\ifx\csname RequirePackage\endcsname\relax
  \input ltxcmds.sty\relax
  \input eolgrab.sty\relax
\else
  \RequirePackage{ltxcmds}[2016/05/16]%
  \RequirePackage{eolgrab}[2011/01/12]%
\fi
\def\msg#{\immediate\write16}
\def\space{ }
\long\def\Test#1#2#3{%
  \begingroup
    \def\TestExpected{#3}%
    \expandafter\expandafter\expandafter\def
    \expandafter\expandafter\expandafter\TestResult
    \expandafter\expandafter\expandafter{%
      #1#2\@nil
    }%
    \ifx\TestResult\TestExpected
    \else
      \msg{\string\TestExpected: [\meaning\TestExpected]}%
      \msg{\string\TestResult: \space\space[\meaning\TestResult]}%
      \errmessage{Test failed!}%
    \fi
  \endgroup
}
\Test\ltx@carzero{abc}{}
\Test\ltx@carzero{}{}
\Test\ltx@carzero{\par\par}{}
\Test\ltx@cdrzero{}{}
\Test\ltx@cdrzero{abc}{abc}
```

```
\Test\ltx@cdrzero{ \par}{ \par}
\Test\ltx@cdrzero{\@empty}{\@empty}
\Test\ltx@cdrzero{{}}{{}}
\Test\ltx@car{abc}{a}
\Test\ltx@car{\par}{\par}
\Test\ltx@cdr{abc}{bc}
\Test\ltx@cdr{a \par}{ \par}
\Test\ltx@cdr{a\@empty}{\@empty}
\Test\ltx@cartwo{abc}{ab}
\Test\ltx@cartwo{\par\@empty}{\par\@empty}
\Test\ltx@carsecond{abc}{b}
\Test\ltx@carsecond{\@empty b\@empty}{b}
\Test\ltx@carsecond{\par\par\par}{\par}
\Test\ltx@cdrtwo{abc}{c}
\Test\ltx@cdrtwo{ab \par}{ \par}
\Test\ltx@cdrtwo{ab\@empty}{\@empty}
\Test\ltx@cdrtwo{ab{}}{{}}
\Test\ltx@cdrthree{abcdefg}{defg}
\Test\ltx@cdrfour{abcdefg}{efg}
\Test{\ltx@CdrNum{5}}{abcdefg}{fg}
\Test{\ltx@CdrNum{0}}{\par}{\par}
\Test{\ltx@CdrNum{0}}{\@empty}{\@empty}
\Test{\ltx@CdrNum{0}}{{}}{{}}
\Test{\ltx@CdrNum{0}}{ }{ }
\Test{\ltx@CdrNum{2}}{abcd}{cd}
\Test{\ltx@CdrNum{2}}{\vbox\par\hbox\par}{\hbox\par}
\Test{\ltx@carthree}{abcdefg}{abc}
\Test{\ltx@carfour}{abcdefg}{abcd}
\Test{\ltx@CarNum{5}}{abcdefg}{abcde}
\Test{\ltx@CarNum{2}}{\@empty\par}{\@empty\par}
\Test\ltx@carthird{abcdefg}{c}
\Test\ltx@carfourth{abcdefg}{d}
\Test{\ltx@CarNumth{5}}{abcdefg}{e}
\Test{\ltx@CarNumth{2}}{\@empty\@empty\@empty}{\@empty}
\Test{\ltx@CarNumth{2}}{\par\par\par}{\par}
\Test{\ltx@CarNumth{2}}{ab}{b}
\csname @@end\endcsname\end
```
⟨/test-carcdr⟩

4 Installation

4.1 Download

Package. This package is available on CTAN[1]:

CTAN:macros/latex/contrib/oberdiek/ltxcmds.dtx The source file.

CTAN:macros/latex/contrib/oberdiek/ltxcmds.pdf Documentation.

Bundle. All the packages of the bundle 'oberdiek' are also available in a TDS compliant ZIP archive. There the packages are already unpacked and the documentation files are generated. The files and directories obey the TDS standard.

CTAN:install/macros/latex/contrib/oberdiek.tds.zip

TDS refers to the standard "A Directory Structure for TEX Files" (CTAN:tds/tds.pdf). Directories with `texmf` in their name are usually organized this way.

[1] CTAN:pkg/ltxcmds

4.2 Bundle installation

Unpacking. Unpack the `oberdiek.tds.zip` in the TDS tree (also known as `texmf` tree) of your choice. Example (linux):

```
unzip oberdiek.tds.zip -d ~/texmf
```

Script installation. Check the directory `TDS:scripts/oberdiek/` for scripts that need further installation steps.

4.3 Package installation

Unpacking. The `.dtx` file is a self-extracting docstrip archive. The files are extracted by running the `.dtx` through plain TEX:

```
tex ltxcmds.dtx
```

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

```
ltxcmds.sty                    → tex/generic/oberdiek/ltxcmds.sty
ltxcmds.pdf                    → doc/latex/oberdiek/ltxcmds.pdf
test/ltxcmds-test1.tex         → doc/latex/oberdiek/test/ltxcmds-test1.tex
test/ltxcmds-test-gobble.tex   → doc/latex/oberdiek/test/ltxcmds-test-gobble.tex
test/ltxcmds-test-ifempty.tex  → doc/latex/oberdiek/test/ltxcmds-test-ifempty.tex
test/ltxcmds-test-zapspace.tex → doc/latex/oberdiek/test/ltxcmds-test-zapspace.tex
test/ltxcmds-test-ifboxempty.tex → doc/latex/oberdiek/test/ltxcmds-test-ifboxempty.tex
test/ltxcmds-test-nextchar.tex → doc/latex/oberdiek/test/ltxcmds-test-nextchar.tex
test/ltxcmds-test-carcdr.tex   → doc/latex/oberdiek/test/ltxcmds-test-carcdr.tex
ltxcmds.dtx                    → source/latex/oberdiek/ltxcmds.dtx
```

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.

4.4 Refresh file name databases

If your TEX distribution (teTEX, mikTEX, ...) relies on file name databases, you must refresh these. For example, teTEX users run `texhash` or `mktexlsr`.

4.5 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{ltxcmds.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 the configuration file `ltxdoc.cfg`. For instance, put this 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 pdfLaTeX:

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

5 References

[1] Robert R. Schneck: *Re: `\ifempty` solution (was Macro puzzle: maximally general `\ifempty`)*; newsgroup comp.text.tex, news:3eef1ada_6@corp.newsgroups.com, 2003-06-17.
https://groups.google.com/group/comp.text.tex/msg/be03a159ec374895

[2] Ulrich Diez: *Re: TeX refuses to strip outer braces in argument*; newsgroup comp.text.tex, news:ibk3t8$ee7$1@news.albasani.net, 2010-11-12.
https://groups.google.com/group/comp.text.tex/msg/803bd57221a04996

[3] Ahmed Musa: *Re: TeX refuses to strip outer braces in argument*; newsgroup comp.text.tex, news:f5496afe-40ed-42bd-b629-a2419ecf7c0d@o14g2000prn.googlegroups.com, 2010-12-03.
https://groups.google.com/group/comp.text.tex/msg/fbf7d61a0c3a807d

[4] Ulrich Diez: *Re: TeX refuses to strip outer braces in argument*; newsgroup comp.text.tex, news:idbo94uka1@four.albasani.net, 2010-12-03.
https://groups.google.com/group/comp.text.tex/msg/0c230ee479487962

[5] Ulrich Diez: *Re: TeX refuses to strip outer braces in argument*; newsgroup comp.text.tex, news:idbpu4$cg1$1@news.albasani.net, 2010-12-03.
https://groups.google.com/group/comp.text.tex/msg/bbef4263390d647b

[6] Ulrich Diez: *Re: TeX refuses to strip outer braces in argument*; newsgroup comp.text.tex, news:idd4ga$r83$1@four.albasani.net, 2010-12-04.
https://groups.google.com/group/comp.text.tex/msg/00dfd1ec103cd272

[7] GL: *Re: TeX refuses to strip outer braces in argument*; newsgroup comp.text.tex, news:4cfa2e27$0$7389$426a74cc@news.free.fr, 2010-12-04.
https://groups.google.com/group/comp.text.tex/msg/d3a75995c1cf267e

[8] Heiko Oberdiek: *Re: TeX refuses to strip outer braces in argument*; newsgroup comp.text.tex, news:iddhq1$3kj$1@news.eternal-september.org, 2010-12-04.
https://groups.google.com/group/comp.text.tex/msg/5f7a23e3ab70e347

[9] David Kastrup: *How to detect if `\vbox` is empty*; newsgroup comp.text.tex, 2011-02-04.
https://groups.google.com/group/comp.text.tex/msg/8d3cb89496a4d86d

6 History

[2009/08/05 v1.0]

- First version.

[2009/12/12 v1.1]

- Short title shortened.
- `\ltx@IfUndefined` added.

[2010/01/28 v1.2]

- `\ltx@RemovePrefix` and `\ltx@StripPrefix` added.
- `\ltx@ifclassloaded`, `\ltx@ifpackageloaded`, `\ltx@iffileloaded`, `\ltx@ifclasslater`, `\ltx@ifpackagelater`, `\ltx@iffilelater`, `\ltx@clsextension`, `\ltx@pkgextension` added.
- `\ltx@GlobalAppendToMacro`, `\ltx@LocalAppendToMacro` added.

[2010/03/01 v1.3]

- `\ltx@newif` added.
- `\ltx@ifnextchar` added.
- Numbers `\ltx@zero`, `\ltx@one`, `\ltx@two`, `\ltx@cclv` added.

[2010/03/09 v1.4]

- `\ltx@pkgextension` and `\ltx@clsextension` are hardcoded to avoid trouble with `\@onlypreamble`.

[2010/04/08 v1.5]

- `\ltx@cartwo`, `\ltx@cdrtwo`, `\ltx@carthree`, `\ltx@cdrthree`, `\ltx@carfour`, `\ltx@cdrfour` added.
- `\ltx@ReturnAfterFi` and `\ltx@ReturnAfterElseFi` fixed.

[2010/04/16 v1.6]

- `\ltx@leavevmode`, `\ltx@mbox` added.

[2010/04/26 v1.7]

- `\ltx@GobbleNum`, `\ltx@CdrNum`, `\ltx@CarNum` added.
- `\ltx@carzero`, `\ltx@cdrzero` added.
- `\ltx@hashchar` added.

[2010/09/11 v1.8]

- `\ltx@leftbracechar`, `\ltx@rightbracechar` added.

[2010/10/25 v1.9]

- `\ltx@LocalAppendToMacro` and `\ltx@GlobalAppendToMacro` are now `\long`.

[2010/10/31 v1.10]

- `\ltx@newglobalif` added.

[2010/11/12 v1.11]

- `\ltx@ifempty` added.
- `\ltx@firstofthree`, `\ltx@secondofthree`, `\ltx@thirdofthree` added.

[2010/12/02 v1.12]

- `\ltx@onelevel@sanitize` added.
- `\LTXcmds@num` fixed for the case with `\numexpr` (bug found by GL).

[2010/12/04 v1.13]

- `\ltx@ifblank` added.
- Optimization for `\ltx@ifempty`.

[2010/12/07 v1.14]

- `\ltx@zapspace` added.

[2010/12/12 v1.15]

- `\ltx@minusone` added.

[2011/02/04 v1.16]

- `\ltx@IfBoxEmpty` and `\ltx@IfBoxVoidOrEmpty` added.
- `\ltx@firstoffour`, ..., `\ltx@fourthoffour` added.

[2011/02/05 v1.17]

- `\ltx@IfBoxEmpty`: an empty box may have non-zero dimensions.

[2011/03/16 v1.18]

- `\ltx@ifclasslater` fixed.

[2011/04/14 v1.19]

- `\ltx@ifnextchar`: detection of optional spaces modified.
- `\ltx(Loc,Glob)(Toks,Dimen,Skip)(A,B,C,D,E)` added.

[2011/04/18 v1.20]

- `\ltx@ifnextchar` with conditional support (thanks GL for bug report).

[2011/08/22 v1.21]

- `\ltx@GlobalPrependToMacro`, `\ltx@LocalPrependToMacro` added (feature request of Martin Münch).

[2011/11/09 v1.22]

- `\ltx@carsecond`, `\ltx@carthird`, `\ltx@carfourth`, `\ltx@CarNumth` added.
- `\ltx@cdrzero`, `\ltx@cdr`, `\ltx@cdrtwo`, csltx@cdrthree, `\ltx@cdrfour`, `\ltx@CdrNum` modified to retain braces and spaces. They are expandable in two expansion steps.

[2016/05/16 v1.23]

- Documentation updates.

7 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.

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