

# The `longtable` package\*

David Carlisle<sup>†</sup>

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## Abstract

This package defines the `longtable` environment, a multi-page version of `tabular`.

## List of Tables

1	An optional table caption (used in the list of tables)	2
2	A floating table	4
3	A difficult <code>\multicolumn</code> combination: pass 1	6
4	A difficult <code>\multicolumn</code> combination: pass 2	6
5	A difficult <code>\multicolumn</code> combination: pass 3	6
6	A difficult <code>\multicolumn</code> combination: pass 4	6
7	A summary of <code>longtable</code> commands	9

## 1 Introduction

`longtable` (*env.*) The `longtable` package defines a new environment, `longtable`, which has most of the features of the `tabular` environment, but produces tables which may be broken by T<sub>E</sub>X's standard page-breaking algorithm. It also shares some features with the `table` environment. In particular it uses by default the same counter, `table`, and has a similar `\caption` command. Also, the standard `\listoftables` command lists tables produced by either the `table` or `longtable` environments.

The following example uses most of the features of the `longtable` environment. An edited listing of the input for this example appears in Section 9.

**Note:** Various parts of the following table will **not** line up correctly until this document has been run through L<sup>A</sup>T<sub>E</sub>X several times. This is a characteristic feature of this package, as described below.

\*This file has version number v4.26, last revised 2026-01-19.

<sup>†</sup>The new algorithm for aligning 'chunks' of a table used in version 4 of this package was devised, coded and documented by David Kastrup.

Table 1: A long table

* This part appears at the top of the table		*
* FIRST    SECOND		*
*	longtable columns are specified same way as in the tabular @{*}r  p{1in}@{*} Each row ends with a The \\ command has an argument, just as in tabular	in the environment. in this case. \\ command. optional the environment.
*	See the effect of \\[10pt] Lots of lines Lots of lines Lots of lines Lots of lines Also \\hline may be used,	?
*	That was a \\hline	like this. like this. like this. like this. like this. as in tabular.
*	That was \\hline\\hline	.
	This is a \\multicolumn{2}{  c  }	.
*	If a page break occurs at a \\hline then at the bottom of one page and at the	a line is drawn top of the next.
*	The [t] [b] [c] argument of tabular The optional argument may be one of to specify whether the table should be to the left, right	can not be used.* [l] [r] [c] adjusted or centrally.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	Lots of lines	like this.
*	This goes at the	bottom.

Table 1: (continued)

*	This part appears at the top of every other page	*
*	First	Second
*Some lines may take up a lot of space, like this:		This last* column is a “p” column so this “row” of the table can take up several lines. Note however that <small>TEX</small> will never break a page within such a row. Page breaks only occur between rows of the table or at \hline commands.
*	Lots of lines	like this. *
*	Lots of lines	like this. *
*	Lots of lines	like this. *
*	Lots of lines	like this. *
*	Lots of lines	like this. *
*	Lots of lines	like this. *
*	Lots of lines	like this. *
*	Lots of lines	like this. *
*	Lots of lines	like this. *
*	Lots of lines	like this. *
*	Lots of lines	like this. *
*	Lots of lines	like this. *
*	These lines will in place of the at the end	appear usual foot of the table *

## 2 Chunk Size

**LTchunksize** In order to TEX multi-page tables, it is necessary to break up the table into smaller chunks, so that TEX does not have to keep everything in memory at one time. By default longtable uses 20 rows per chunk, but this can be set by the user, with e.g., `\setcounter{LTchunksize}{10}`.<sup>3</sup> These chunks do not affect page breaking, thus if you are using a TEX with a lot of memory, you can set **LTchunksize** to be several pages of the table. TEX will run faster with a large **LTchunksize**.

<sup>1</sup>This is a footnote.

<sup>2</sup>longtable takes special precautions, so that footnotes may also be used in ‘p’ columns.

<sup>3</sup>You can also use the plain TEX syntax `\LTchunksize=10`.

.....longtable.sty.....

A	tabular	environment
within	a floating	table

Table 2: A floating table

However, if necessary, `longtable` can work with `LTchunksize` set to 1, in which case the memory taken up is negligible. Note that if you use the commands for setting the table head or foot (see below), the `LTchunksize` must be at least as large as the number of rows in each of the head or foot sections.

This document specifies `\setcounter{LTchunksize}{200}`. If you look at the previous table, after the *first* run of L<sup>A</sup>T<sub>E</sub>X you will see that various parts of the table do not line up. L<sup>A</sup>T<sub>E</sub>X will also have printed a warning that the column widths had changed. `longtable` writes information onto the `.aux` file, so that it can line up the different chunks. Prior to version 4 of this package, this information was not used unless a `\setlongtables` command was issued, however, now the information is always used, via a new algorithm,<sup>4</sup> and so `\setlongtables` is no longer needed. It is defined (but does nothing) for the benefit of old documents that use it.

### 3 Counter and Caption Types

As mentioned in the introduction `longtable` uses and updates by default the `table` counter, the `\caption` command creates a table caption which is added to the list of tables. Packages like `ltcaption` added more flexibility here by adding the command `\LTcaptype` which allowed to change the type, e.g. to a listing. Starting with version 4.21 `longtable` supports this command directly. By redefining this command it is possible to change the counter and caption type. After `\renewcommand{\LTcaptype}{<counter>}` `longtable` will update the counter `<counter>`, use `\fnum@<counter>` in the caption (which typically will make use of `\<counter>name` and `\the<counter>`), and write content line entries into the file with the extension stored in the command `\ext@<counter>`. When `hyperref` is loaded the name of the anchor will use `<counter>` too. Packages or documents that change `\LTcaptype` to some nonstandard value must ensure that the counter `<counter>` and the commands `\fnum@<counter>` and `\ext@<counter>` exist and do not error. If `\LTcaptype` is empty no counter is advanced and `\<counter>name` in the caption is suppressed.

### 4 Captions and Headings

At the start of the table one may specify lines which are to appear at the top `\endhead` of every page (under the headline, but before the other lines of the table). The lines are entered as normal, but the last `\V` command is replaced by a `\endhead` command. If the first page should have a different heading, then this should be entered in the same way, and terminated with the `\endfirsthead` command. The `LTchunksize` should be at least as large as the number of rows in the heading. There are also `\endfoot` and `\endlastfoot` commands which are used in the same

<sup>4</sup>Due to David Kastrup.

.....Page 4.....

way (at the *start* of the table) to specify rows (or an `\hline`) to appear at the bottom of each page. In certain situations, you may want to place lines which logically belong in the table body at the end of the `firsthead`, or the beginning of the `lastfoot`. This helps to control which lines appear on the first and last page of the table.

**\caption** The `\caption{...}` command is essentially equivalent to  
`\multicolumn{n}{c}{\parbox{\LTcapwidth}{...}}`  
 where `n` is the number of columns of the table. You may set the width of the caption with a command such as `\setlength{\LTcapwidth}{2in}` in the preamble of your document. The default is 4in. `\caption` also writes the information to produce an entry in the list of tables. As with the `\caption` command in the `figure` and `table` environments, an optional argument specifies the text to appear in the list of tables if this is different from the text to appear in the caption. Thus the caption for table 1 was specified as `\caption[An optional table caption (used in the list of tables)]{A long table\label{long}}`.

You may wish the caption on later pages to be different to that on the first page. In this case put the `\caption` command in the first heading, and put a subsidiary caption in a `\caption[]` command in the main heading. If the optional argument to `\caption` is empty, no entry is made in the list of tables. Alternatively, if you do not want the table number to be printed each time, use the `\caption*` command.

The captions are set based on the code for the `article` class. If you have re-defined the standard `\@makecaption` command to produce a different format for the captions, you may need to make similar changes to the `longtable` version, `\LT@makecaption`. See the code section for more details.

A more convenient method of customising captions is given by the `caption(2)` package, which provides commands for customising captions, and arranges that the captions in standard environments, and many environments provided by packages (including `longtable`) are modified in a compatible manner.

You may use the `\label` command so that you can cross reference `longtables` with `\ref`. Note, however, that the `\label` command should not be used in a heading that may appear more than once. Place it either in the `firsthead`, or in the body of the table. It should not be the `first` command in any entry.

## 5 Multicolumn entries

The `\multicolumn` command may be used in `longtable` in exactly the same way as for `tabular`. So you may want to skip this section, which is rather technical, however coping with `\multicolumn` is one of the main problems for an environment such as `longtable`. The main effect that a user will see is that certain combinations of `\multicolumn` entries will result in a document needing more runs of `LATeX` before the various ‘chunks’ of a table align.

The examples in this section are set with `LTchunksize` set to the minimum value of one, to demonstrate the effects when `\multicolumn` entries occur in different chunks.

Consider Table 3. In the second chunk, `longtable` sees the wide `multicolumn` entry. At this point it thinks that the first two columns are very narrow. All the width of the `multicolumn` entry is assumed to be in the third column. (This is a ‘feature’ of `TeX`’s primitive `\halign` command.) `longtable` then passes the

.....longtable.sty.....

Table 3: A difficult `\multicolumn` combination: pass 1

1	2	3
wide multicolumn spanning 1-3		
multicolumn 1-2		3
wide 1	2	3

Table 4: A difficult `\multicolumn` combination: pass 2

1	2	3
wide multicolumn spanning 1-3		
multicolumn 1-2		3
wide 1	2	3

Table 5: A difficult `\multicolumn` combination: pass 3

1	2	3
wide multicolumn spanning 1-3		
multicolumn 1-2		3
wide 1	2	3

Table 6: A difficult `\multicolumn` combination: pass 4

1	2	3
wide multicolumn spanning 1-3		
multicolumn 1-2		3
wide 1	2	3

.....Page 6.....

information that there is a wide third column to the later chunks, with the result that the first pass over the table is too wide.

If the ‘saved row’ from this first pass was re-inserted into the table on the next pass, the table would line up in two passes, but would be much too wide.

`\kill` The solution to this problem used in Versions 1 and 2, was to use a `\kill` line. If a line is `\killed`, by using `\kill` rather than `\\"` at the end of the line, it is used in calculating column widths, but removed from the final table. Thus entering `\killed` copies of the last two rows before the wide multicolumn entry would mean that `\halign` ‘saw’ the wide entries in the first two columns, and so would not widen the third column by so much to make room for the multicolumn entry.

In Version 3, a new solution was introduced. If the saved row in the `.aux` file was not being used, `longtable` used a special ‘draft’ form of `\multicolumn`, this modified the definition, so the spanning entry was never considered to be wider than the columns it spanned. So after the first pass, the `.aux` file stored the widest normal entry for each column, no column was widened due to `\spanned` columns. By default `longtable` ignored the `.aux` file, and so each run of L<sup>A</sup>T<sub>E</sub>X was considered a first pass. Once the `\setlongtables` declaration was given, the saved row in the `.aux` file, and the proper definition of `\multicolumn` were used. If any `\multicolumn` entry caused one of the columns to be widened, this information could not be passed back to earlier chunks, and so the table would not correctly line up until the third pass. This algorithm always converged in three passes as described above, but in examples such as the ones in Tables 3–6, the final widths were not optimal as the width of column 2, which is determined by a `\multicolumn` entry, was not known when the final width for column 3 was fixed, due to the fact that *both* `\multicolumn` commands were switched from ‘draft’ mode to ‘normal’ mode at the same time.

Version 4 alleviates the problem considerably. The first pass of the table will indeed have the third column much too wide. However, on the next pass `longtable` will notice the error and reduce the column width accordingly. If this has to propagate to chunks before the `\multicolumn` one, an additional pass will, of course, be needed. It is possible to construct tables where this rippling up of the correct widths takes several passes to ‘converge’ and produce a table with all chunks aligned. However in order to need many passes one needs to construct a table with many overlapping `\multicolumn` entries, all being wider than the natural widths of the columns they span, and all occurring in different chunks. In the typical case the algorithm will converge after three or four passes, and the benefits of not needing to edit the document before the final run to add `\setlongtables`, and the better choice of final column widths in the case of multiple `\multicolumn` entries will hopefully more than pay for the extra passes that may possibly be needed.

So Table 3 converges after 4 passes, as seen in Table 6.

You can still speed the convergence by introducing judicious `\kill` lines, if you happen to have constellations like the above.

If you object even to L<sup>A</sup>T<sub>E</sub>X-ing a file twice, you should make the first line of every `longtable` a `\kill` line that contains the widest entry to be used in each column. All chunks will then line up on the first pass.

## 6 Adjustment

The optional argument of `longtable` controls the horizontal alignment of the table. The possible options are `[c]`, `[r]` and `[l]`, for centring, right and left adjustment, respectively. Normally centring is the default, but this document specifies

```
\LTleft \setlength\LTleft\parindent
\LTright \setlength\LTright\fill
```

in the preamble, which means that the tables are set flush left, but indented by the usual paragraph indentation. Any lengths can be specified for these two parameters, but at least one of them should be a rubber length so that it fills up the width of the page, unless rubber lengths are added between the columns using the `\extracolsep` command. For instance

```
\begin{tabular*}{\textwidth}{@{\extracolsep{...}}...}
```

produces a full width table, to get a similar effect with `longtable` specify

```
\setlength\LTleft{0pt}
\setlength\LTright{0pt}
\begin{longtable}{@{\extracolsep{...}}...}
```

## 7 Changes

This section highlights the major changes since version 2. A more detailed change log may be produced at the end of the code listing if the `ltxdoc.cfg` file specifies

```
\AtBeginDocument{\RecordChanges}
\AtEndDocument{\PrintChanges}
```

Changes made between versions 2 and 3.

- The mechanism for adding the head and foot of the table has been completely rewritten. With this new mechanism, `longtable` does not need to issue a `\clearpage` at the start of the table, and so the table may start half way down a page. Also the `\endlastfoot` command, which could not safely be implemented under the old scheme, has been added.
- `longtable` now issues an error if started in the scope of `\twocolumn`, or the `multicols` environment.
- The separate documentation file `longtable.tex` has been merged with the package file, `longtable.dtx` using Mittelbach's `doc` package.
- Support for footnotes has been added. Note however that `\footnote` will not work in the 'head' or 'foot' sections of the table. In order to put a footnote in those sections (e.g., inside a caption), use `\footnotemark` at that point, and `\footnotetext` anywhere in the table *body* that will fall on the same page.
- The treatment of `\multicolumn` has changed, making `\kill` lines unnecessary, at the price of sometimes requiring a third pass through L<sup>A</sup>T<sub>E</sub>X.
- The `\newpage` command now works inside a `longtable`.

Changes made between versions 3 and 4.

- A new algorithm is used for aligning chunks. As well as the widest width in each column, `longtable` remembers which chunk produced this maximum. This allows it to check that the maximum is still achieved in later runs. As `longtable` can now deal with columns shrinking as the file is edited, the `\setlongtables` system is no longer needed and is disabled.
- An extra benefit of the new algorithm's ability to deal with 'shrinking' columns is that it can give better (narrower) column widths in the case of overlapping `\multicolumn` entries in different chunks than the previous algorithm produced.
- The 'draft' multicolumn system has been removed, along with related commands such as `\LTmulticolumn`.
- The disadvantage of the new algorithm is that it can take more passes. The theoretical maximum is approximately twice the length of a 'chain' of columns with overlapping `\multicolumn` entries, although in practice it usually converges as fast as the old version. (Which always converged in three passes once `\setlongtables` was activated.)
- `\\\*` and `\nopagebreak` commands may be used to control page breaking.

## 8 Summary

Table 7: A summary of `longtable` commands

Parameters		
<code>\LTleft</code>	Glue to the left of the table.	( <code>\fill</code> )
<code>\LTright</code>	Glue to the right of the table.	( <code>\fill</code> )
<code>\LTpre</code>	Glue before the table.	( <code>\bigskipamount</code> )
<code>\LTpost</code>	Glue after the table.	( <code>\bigskipamount</code> )
<code>\LTcapwidth</code>	The width of a parbox containing the caption.	(4in)
<code>LTchunksize</code>	The number of rows per chunk.	(20)
Optional arguments to <code>\begin{longtable}</code>		
<code>none</code>	Position as specified by <code>\LTleft</code> and <code>\LTright</code> .	
<code>[c]</code>	Centre the table.	
<code>[l]</code>	Place the table flush left.	
<code>[r]</code>	Place the table flush right.	
Commands to end table rows		
<code>\\\</code>	Specifies the end of a row	
<code>\\\[&lt;dim&gt;]</code>	Ends row, then adds vertical space (as in the <code>tabular</code> environment).	
<code>\\\*</code>	The same as <code>\\\</code> but disallows a page break after the row.	
<code>\tabularnewline</code>	Alternative to <code>\\\</code> for use in the scope of <code>\raggedright</code> and similar commands that redefine <code>\\\</code> .	
<code>\kill</code>	Row is 'killed', but is used in calculating widths.	
<code>\endhead</code>	Specifies rows to appear at the top of every page.	
<code>\endfirsthead</code>	Specifies rows to appear at the top of the first page.	

## .....longtable.sty.....

\endfoot	Specifies rows to appear at the bottom of every page.
\endlastfoot	Specifies rows to appear at the bottom of the last page.

## longtable caption commands

\caption{\{<caption>\}}	Caption ‘Table ?: <caption>’, and a ‘<caption>’ entry in the list of tables.
\caption[\{lot\}]\{<caption>\}	Caption ‘Table ?: <caption>’, and a ‘<lot>’ entry in the list of tables.
\caption[]\{<caption>\}	Caption ‘Table ?: <caption>’, but no entry in the list of tables.
\caption*\{<caption>\}	Caption ‘<caption>’, but no entry in the list of tables.

## Commands available at the start of a row

<code>\pagebreak</code>	Force a page break.
<code>\pagebreak[<i>val</i>]</code>	A ‘hint’ between 0 and 4 of the desirability of a break.
<code>\nopagebreak</code>	Prohibit a page break.
<code>\nopagebreak[<i>val</i>]</code>	A ‘hint’ between 0 and 4 of the undesirability of a break.
<code>\newpage</code>	Force a page break.

## Footnote commands available inside `longtable`

\footnote	Footnotes, but may not be used in the table head & foot.
\footnotemark	Footnotemark, may be used in the table head & foot.
\footnotetext	Footnote text, use in the table body.

## Setlongtables

\setlongtables      Obsolete command. Does nothing now.

.....longtable.sty.....

## 9 Verbatim highlights from Table 1

```
\begin{longtable}{@{*}r||p{1in}@{*}}
KILLED & LINE!!!! \kill
\caption[An optional table caption ...]{A long table\label{long}}\\
\hline\hline
\multicolumn{2}{@{*}c@{*}}%
{This part appears at the top of the table}\\
\textsc{First}\&\textsc{Second}\\
\hline\hline
\endfirsthead
\caption[][(continued)]\\
\hline\hline
\multicolumn{2}{@{*}c@{*}}%
{This part appears at the top of every other page}\\
\textbf{First}\&\textbf{Second}\\
\hline\hline
\endhead
\hline
This goes at the&bottom.\\
\hline
\endfoot
\hline
These lines will&appear\\
in place of the & usual foot\\
at the end& of the table\\
\hline
\endlastfoot
\env{longtable} columns are specified& in the \\
same way as in the \env{tabular}& environment.\\
...
\multicolumn{2}{||c||}{This is a ...}\\
...
Some lines may take...&
\raggedleft This last column is a ‘‘p’’ column...
\tabularnewline
...
Lots of lines& like this.\\
...
\hline
Lots\footnote{...} of lines& like this.\\
Lots of lines& like this\footnote{...}\\
\hline
Lots of lines& like this.\\
...
\end{longtable}
```

.....Page 11.....

```
.....longtable.sty.....
```

## 10 The Macros

```
1 <*package>
```

### 10.1 Initial code

Before declaring the package options, we must define some defaults here.

**\LT@err** The error generating command

```
2 \def\LT@err{\PackageError{longtable}}
```

**\LT@warn** The warning generating command

```
3 \def\LT@warn{\PackageWarning{longtable}}
```

**\LT@final@warn** If any longtables have not aligned, generate a warning at the end of the run at **\AtEndDocument**.

```
4 \def\LT@final@warn{%
```

```
5   \AtEndDocument{%
```

```
6     \LT@warn{Table \@width s have changed. Rerun LaTeX.\@gobbletwo}{}%
```

```
7   \global\let\LT@final@warn\relax}
```

### 10.2 Options

The first two options deal with error handling. They are compatible with the options used by the **tracefnt** package.

**errorshow** *Only* show errors on the terminal. ‘warnings’ are just sent to the log file.

```
8 \DeclareOption{errorshow}{%
```

```
9   \def\LT@warn{\PackageInfo{longtable}}}
```

**pausing** Make every warning message into an error so TeX stops. May be useful for debugging.

```
10 \DeclareOption{pausing}{%
```

```
11   \def\LT@warn#1{%
```

```
12     \LT@err{#1}{This is not really an error}}}
```

**set** The next options are just alternative syntax for the **\setlongtables** declaration.

**final** 13 \DeclareOption{set}{}  
14 \DeclareOption{final}{}  
15 \ProcessOptions

### 10.3 User Settable Parameters

**\LTleft** Glue to the left and right of the table, default **\fill** (ie centred).

**\LTright** 16 \newskip\LTleft \LTleft=\fill  
17 \newskip\LTright \LTright=\fill

**\LTpre** Glue before and after the longtable. **\bigskip** by default.

**\LTpost** 18 \newskip\LTpre \LTpre=\bigskipamount  
19 \newskip\LTpost \LTpost=\bigskipamount

**\LTchunksize** Chunk size (the number of rows taken per **\halign**). Default 200.

```
20 \newcount\LTchunksize \LTchunksize=200
```

```
.....Page 12.....
```

.....longtable.sty.....

```
\c@LTchunksize Added in V3.07 to allow the LATEX syntax \setcounter{LTchunksize}{10}.

21 \let\c@LTchunksize\LTchunksize

\LTcapwidth Width of the \parbox containing the caption. Default 4in.

22 \newdimen\LTcapwidth \LTcapwidth=4in

\LTcaptype The name used as counter, in caption, \addcontentsline and in targets.
\providecommand is used for compatibility with \tcaption

23 \providecommand\LTcaptype{table}
```

## 10.4 Internal Parameters

```
\LT@head Boxes for the table head and foot.

\LT@firsthead 24 \newbox\LT@head
\LT@foot 25 \newbox\LT@firsthead
\LT@lastfoot 26 \newbox\LT@foot
27 \newbox\LT@lastfoot

\LT@gbox
28 \newbox\LT@gbox

\LT@cols Counter for number of columns.

29 \newcount\LT@cols

\LT@rows Counter for rows up to chunksize.

30 \newcount\LT@rows

\c@LT@tables Counter for the tables, added in V3.02. Previous versions just used the LATEX
counter table, but this fails if table is reset during a document, eg report class
resets it every chapter.

This was changed from \newcount\LT@tables in V3.04. LATEX counters are
preserved correctly when \includeonly is used. In the rest of the file \LT@tables
has been replaced by \c@LT@tables without further comment.

31 \newcounter{LT@tables}
32 \providecommand\theLT@tables{\theLT@tables}

\c@LT@chunks We need to count through the chunks of our tables from Version 4 on.

33 \newcounter{LT@chunks}[LT@tables]

\c@table If the table counter is not defined (eg in letter style), define it. (Added in
\fnum@table V3.06.)

\tablename 34 \ifx\c@table\undefined
\ext@table 35 \newcounter{table}
36 \def\fnum@table{\tablename~\thetable}
37 \fi
38 \ifx\tablename\undefined
39 \def\tablename{Table}
40 \fi
41 \ifx\ext@table\undefined
42 \def\ext@table{lot}
43 \fi
```

.....Page 13.....

.....longtable.sty.....

\LT@out In a normal style, `longtable` uses the `.aux` file to record the column widths. With `letter.sty`, use a separate `.lta` file. (Added in V3.06.)

Not needed for new letter class.

```
41 \ifx\startlabels\undefined
42   \let\@auxout\@auxout
43 \else
44   {\@input{\jobname.lta}}%
45   \newwrite\@auxout
46   \immediate\openout\@auxout=\jobname.lta
47 \fi
```

\LT@p@ftn Temporary storage for footnote text in a ‘p’ column.

```
48 \newtoks\LT@p@ftn
```

\LT@end@pen Special penalty for the end of the table. Done this way to save using up a count register.

```
49 \mathchardef\LT@end@pen=30000
```

## 10.5 The `longtable` environment

\longtable Called by `\begin{longtable}`. This implementation does not work in multiple column formats. `\par` added at V3.04.

```
50 \def\longtable{%
51   \par
52   \if@noskipsec\mbox{}\par\fi
53   \nobreakfalse
54   \ifx\multicols\undefined
55   \else
56     \ifnum\col@number>\@ne
57       \twocolumntrue
58     \fi
59   \fi
60   \if@twocolumn
61     \LT@err{longtable not in 1-column mode}\@ehc
62   \fi
63   \UseTaggingSocket{tbl/vmode/begin}%
64   \begingroup
```

Check for an optional argument.

```
65   \ifnextchar[\LT@array{\LT@array[x]}]
```

\LT@array

```
66   {@@=tbl}
67   \ExplSyntaxOn
```

Start setting the alignment. Based on `\@array` from the L<sup>A</sup>T<sub>E</sub>X kernel and the `array` package.

Since Version 3.02, `longtable` has used the internal counter `\c@LT@tables`. The L<sup>A</sup>T<sub>E</sub>X counter `table` is still incremented so that `\caption` works correctly.

```
68   \def\LT@array[#1]#2{%
```

.....Page 14.....

.....longtable.sty.....

With respect to tagging we have a complicated situation with longtable. When at the begin the `\endhead`, `\endfirsthead`, `\endfoot` and `\endlastfoot` are used to setup head and foot they create each a structure subtree with one or more rows. From these structures we want to keep at most two (head and foot) and move the foot to the end of the table. When the head and foot boxes are (re)inserted on following pages we want to mark them up as artifact with the exception of the head at the begin and the foot box at the end.

TODO: When a line is killed the structure subtree is there already too and must be removed. If hard to do, then maybe at first warn if the construction is used.

`\LT@array` is executed in a group, so we can disable para-tagging here.

```
65  \UseTaggingSocket{tbl/init}
66  \tl_if_empty:eTF { \LTcaptive }
67  {
68      \tl_gset:Ne \currentHref {LT@tables.\theH@tables}
69  }
70  {
71      \kernel@refstepcounter{\LTcaptive}\stepcounter{LT@tables}
```

The target is created rather late and a `\label` can come earlier, so we have to define `\currentHref` explicitly. We can't currently assume that `\theH@table` is defined always.

```
72      \tl_gset:Ne \currentHref {LTcaptive.\cs_if_exist_use:c {theH\LTcaptive}}
73  }
74  \tbl_gzero_row_count:
75  \UseTaggingSocket{tbl/longtable/init}
```

Set up the glue around the table if an optional argument given.

```
76  \if l#1%
77      \LTleft\z@ \LTright\fill
78  \else\if r#1%
79      \LTleft\fill \LTright\z@
80  \else\if c#1%
81      \LTleft\fill \LTright\fill
82  \fi\fi\fi
```

Set up these internal commands for longtable.

```
\global\let\LT@mcw@rn\relax
83  \let\LT@mcol\multicolumn
```

Now redefine `\@tabarray` to restore `\hline` and `\multicolumn` so that arrays and tabulars nested in longtable (or in page headings on longtable pages) work out OK. Saving the original definitions done here so that you can load the `array` package before or after longtable.

```
84  \let\LT@@@@tabarray\@tabarray
85  \let\LT@@@@h\hline
86  \def\@tabarray{%
87      \let\hline\LT@@@@h
\let\multicolumn\LT@mcol
```

.....Page 15.....

.....longtable.sty.....

```
88      \LT@CC@tabarray}%
89      \let\\LT@tabularcr
90      \let\tabularnewline\\%
91      \def\newpage{\noalign{\break}}%
```

More or less standard definitions, but first start a `\noalign`.

```
92      \def\pagebreak{\noalign{\ifnum'=0\fi\@testopt{\LT@no@pgbk-}4}%
93      \def\nopagebreak{\noalign{\ifnum'=0\fi\@testopt{\LT@no@pgbk4}}%
94      \let\hline\LT@hline \let\kill\LT@kill\let\caption\LT@caption
95      \@tempdima\ht\strutbox
96      \let\@endpbox\LT@endpbox
```

Set up internal commands according to Lamport or Mittelbach.

```
97      \ifx\extrarowheight\undefined
```

Initialise these commands as in `tabular` from the L<sup>A</sup>T<sub>E</sub>X kernel.

```
98      \let\@acol\@atabcol
99      \let\@classz\@tabclassz \let\@classiv\@tabclassiv
100     \def\@startpbox{\vtop\LT@startpbox}%
101     \let\@@@@startpbox\@startpbox
102     \let\@@@@endpbox\@endpbox
103     \let\LT@LL@FM@cr\@tabularcr
104     \else
```

Initialise these commands as in `array`. `\dollar` replaced by `\dollarbegin` `\dollarend` in V3.03 to match `array` V2.0h. We do not need to set `\dollarbegin` and `\dollarend` as the `array` package gives them the correct values at the top level.

```
105     \advance\@tempdima\extrarowheight
106     \col@sep\@tabcolsep
107     \let\@startpbox@action\LT@startpbox
108     \let\LT@LL@FM@cr\@arraycr
109     \fi
```

The rest of this macro is mainly based on `array` package, but should work for the standard `tabular` too.

```
110     \setbox\@arstrutbox\hbox{\vrule
111         \@height \arraystretch \@tempdima
112         \@depth \arraystretch \dp \strutbox
113         \@width \z@}%
114     \let\@sharp##\let\protect\relax
```

Interpret the preamble argument.

```
115     \begingroup
116     \@mkpream{\#2}%
117     \tbl_count_table_cols:
```

We need to rename `\@preamble` here as F.M.'s scheme uses `\global`, and we may need to nest `\@mkpream`, eg for `\multicolumn` or an `array`. We do not need to worry about nested `longtables` though!

```
118     \xdef\LT@bchunk{%
```

We aren't inside any row when a chunk starts.

```
119     \tbl_inbetween_rows:
```

.....Page 16.....

.....longtable.sty.....

```
120      \global\advance\c@LT@chunks@ne
121      \global\LT@rows\z@\setbox\z@\vbox\bgroup
```

The following line was added in v4.05. In order to get the `\penalties` to work at chunk boundaries, we need to take more care about where and when `\lineskip` glue is added. The following does nothing at top of table, and in header chunks, but in normal body chunks it sets `\prevdepth` (to 0pt, but any value would do) so that `\lineskip` glue will be added. The important thing to note is that the glue will be added *after* any vertical material coming from `\noalign`.

```
122      \LT@setprevdepth
123      \tabskip\LTleft \noexpand\halign to\hsize\bgroup
124 %      \tabskip\LTleft\halign to\hsize\bgroup
125      \tabskip\z@\v@arstrut
```

Insert the tagging socket to start the row and initialize the cell data for the row.

```
126      \UseTaggingSocket{tbl/row/begin}%
127      \ArrayLoadedT { \c@_hook_use_protected:nV {tbl/row/begin} \g_@@_row_int }
128      \tbl_init_cell_data_for_row:
129      \c@preamble \tabskip\LTright \cr}%
130  \endgroup
```

Find out how many columns we have (store in `\LT@cols`).

```
131  \expandafter\LT@nofcols\LT@bchunk\LT@nofcols
```

This is the point at which other packages can add some initializations. Not 100% sure this is the best place—usage will have to decide if this needs moving earlier or later.

```
132  \ArrayLoadedT {
133      \exp_args:Nno \hook_use:nnw {tbl/init} {2}
134          \g_@@_table_cols_tl {#2}
135  }
```

Get the saved row from `\LT@i...` `\LT@ix` (from the `.aux` file), or make a new blank row.

```
136  \LT@make@row
```

A few more internal commands for `longtable`.

```
137  \m@th\let\par\empty
```

Tagging socket and conditional

```
138  \everycr{%
139      \noalign{%
```

In `longtable` we have a bunch of extra `\crs` that are executed whenever a chunk ends. In that case they should not increment the main row counter, sigh.

TODO: At the moment this tracing still exposes the internal row counter!

```
140  \c@_trace:n {--longtable-->`chunk`row:~ \the\LT@rows \space
141          row:~ \the\g_@@_row_int \space
142          column:~ \the\g_@@_col_int
143  }
```

.....Page 17.....

.....longtable.sty.....

```
144     \tbl_if_row_was_started:T
145     {
146         \ArrayLoadedT
147         { \@@_hook_use_protected:nV {tbl/row/end}
148             \g_@@_row_int }
149     \UseTaggingSocket{tbl/row/end}
```

The next setting prevents any of the additional \crs at the end of the chunk to add another /TR. Then once we really start a new chunk it gets incremented so...

```
150     \tbl_inbetween_rows:
151 }
```

And for the same reason such \crs should not increment the main row counter (but it has to be incremented after the preamble of a chunk), so here we test against \LT@rows which is \LTchunksize at the end of a chunk.

```
152     \int_compare:nNnT \LT@rows < \LTchunksize
153     { \tbl_gincr_row_count:    % next is row about to start
```

Finally, we call the hook the makes any initializations for a possibly upcoming row (there may not be any, but we don't know that at this point). As we are still inside the \noalign but may want to issue a \cline or \rowcolor from within this hook we temporarily render \noalign a no-op.

```
154     \ArrayLoadedT
155     {
156         \cs_set_eq:NN \noalign \prg_do_nothing:
157         \@@_hook_use_protected:nV {tbl/row/init} \g_@@_row_int
158     }
159 }
160 }%
161 }%
162 \lineskip\z@\baselineskip\z@
```

Start the first chunk.

```
163 \LT@bchunk}
164 \ExplSyntaxOff
165 <@=
```

\LT@no@pgbk Can simplify the standard \no@pgbk as this is vmode only but then need to close the \noalign.

```
166 \def\LT@no@pgbk#1[#2]{\penalty #1\@getpen{#2}\ifnum`{=0\fi}}
```

\LT@start This macro starts the process of putting the table on the current page. It is not called until either a \\ or \endlongtable command ends a chunk, as we do not know until that point which of the four possible head or foot sections have been specified.

It begins by redefining itself, so that the table is only started once! Until V3.04, was redefined to \relax, now use \endgraf to force the page-breaker to wake up. The second \endgraf is there so that \pagetotal is updated and so takes \LTpre into account.

```
167 <@=tbl>
168 \ExplSyntaxOn
169 \def\LT@start{%
170     \let\LT@start\endgraf
171     \endgraf\penalty\z@\vskip\LTpre\endgraf
```

.....Page 18.....

.....longtable.sty.....

This next block was suggested by Lars Hellström in pr tools/3396. He documents it as:

The original problem occurs because TeX has not yet found an awfully bad (**b=\***) breakpoint and is therefore still collecting material to see if there is a really good break somewhere just ahead. As we know there aren't, we want to make it stop looking and break the page, so that **\pagetotal** will be for the page where the table will actually end up. To achieve this, we need to give TeX an awfully bad, but legal, breakpoint. The simplest way of doing this seems to be to insert a **\kern** that counters the **\pageshrink** for the page, followed by a **\penalty** and a **\par** (to exercise the page builder). We also have to make sure that this breakpoint doesn't affect how the next page is broken, so we make the penalty 9999 (10000 is infinite and thus not a legal breakpoint) and cancel out the **\kern** with a new **\kern**.

I don't think this is the *right* solution to the problem (that would be that the standard output routine has a feature for syncronizing with typesetting, as part of the preparations for switching output routine), but it's OK. Perhaps XOR will make it better.

```
172  \ifdim \pagetotal<\pagegoal \else
173    \dimen@=\pageshrink
174    \advance \dimen@ 1sp %
175    \kern\dimen@\penalty 9999\endgraf \kern-\dimen@
176  \fi
```

Start a new page if there is not enough room for the table head, foot, and one extra line.

```
177  \dimen@\pagetotal
178  \advance\dimen@ \ht\ifvoid\LT@firsthead\LT@head\else\LT@firsthead\fi
179  \advance\dimen@ \dp\ifvoid\LT@firsthead\LT@head\else\LT@firsthead\fi
180  \advance\dimen@ \ht\LT@foot
```

At this point I used to add **\ht\@arstrutbox** and **\dp\@arstrutbox** as a measure of a row size. However this can fail spectacularly for p columns which might be much larger. Previous versions could end up with the table starting with a foot, then a page break then a head *then* a 'first head'! So now measure the first line of the table accurately by **\vsplit**ting it out of the first chunk.

```
181  \edef\LT@reset@vfuzz{\vfuzz\the\vfuzz\vbadness\the\vbadness\relax}%
182  \vfuzz\maxdimen
183  \vbadness\@M
184  \setbox\tw@\copy\z@%
185  \setbox\tw@\vsplit\tw@ to \ht\@arstrutbox
186  \setbox\tw@\vbox{\unvbox\tw@}%
187  \LT@reset@vfuzz
188  \advance\dimen@ \ht
189  \ifdim\ht\@arstrutbox>\ht\tw@\@arstrutbox\else\tw@\fi
190  \advance\dimen@\dp
191  \ifdim\dp\@arstrutbox>\dp\tw@\@arstrutbox\else\tw@\fi
192  \advance\dimen@ -\pagegoal
193  \ifdim \dimen@>\z@
194    \vfil\break
195  \else
```

The LT output routine does not handle shrink on the page, which can cause the first page to be over-long, so forget it is there.

.....Page 19.....

.....longtable.sty.....

```
196     \ifdim\pageshrink>\z@\pageshrink\z@\fi  
197     \fi
```

Store height of page minus table foot in \@colroom.

```
198 \global\@colroom\@colht
```

If the foot is non empty, reduce the \vsize and \@colroom accordingly.

```
199 \ifvoid\LT@foot\else  
200     \global\advance\vsize-\ht\LT@foot  
201     \global\advance\@colroom-\ht\LT@foot  
202     \dimen@\pagegoal\advance\dimen@-\ht\LT@foot\pagegoal\dimen@  
203     \maxdepth\z@  
204 \fi  
205 \tl_if_empty:eTF{\LTcaptype}  
206 {  
207     \MakeLinkTarget{\LT@tables}  
208 }  
209 {  
210     \MakeLinkTarget{\LTcaptype}  
211 }
```

Put the table head on the page, and then switch to the new output routine.

```
212 \ifvoid\LT@firsthead\copy\LT@head\else\box\LT@firsthead\fi\nobreak  
213 \UseTaggingSocket{tbl/longtable/head}  
214 \output{\LT@output}  
215 \ExplSyntaxOff  
216 <@=
```

\endlongtable

```
217 <@=tbl>  
218 \ExplSyntaxOn
```

Called by \end{longtable}.

```
219 \def\endlongtable{%
```

Essentially add a final \\. But as we now know the number of actual chunks, we first strip away all entries referring to a maximum entry beyond the table (this can only happen if a table has been shortened, or the table numbering has gone awry). In that case we at least start collecting valid new information with the last chunk of this table, by removing the width constraint.

```
220 \tbl_crcr:n {\endlongtable}  
221 \noalign{  
222     \UseTaggingSocket{tbl/longtable/finalize}  
223     \let\LT@entry\LT@entry@chop  
224     \xdef\LT@save@row{\LT@save@row}{}%  
225     \LT@echunk  
226     \LT@start  
227     \unvbox\z@  
228     \LT@get@widths}
```

Write the dummy row to the .aux file. Since V3.06, use .lta for letter.sty.

```
229 \if@filesw  
230 { \let\LT@entry\LT@entry@write\immediate\write\@auxout{%
```

.....Page 20.....

..... longtable.sty .....

Since Version 3.02, `longtable` has used the internal counter `\c@LT@tables` rather than the L<sup>A</sup>T<sub>E</sub>X counter `table`. This information looks entirely different from version 3 information. Still, we don't need to rename the macro name because later code will consider the information to have no columns, and thus will throw the old data away.

```
231     \gdef\expandafter\noexpand
232         \csname LT@\romannumeral\c@LT@tables\endcsname
233             {\LT@save@row}}}}%
234 \fi
```

At this point used to issue a warning if a `\multicolumn` has been set in draft mode.

```
\LT@mcw@rn
```

If the last chunk has different widths than the first, warn the user. Also trigger a warning to rerun L<sup>A</sup>T<sub>E</sub>X at the end of the document.

```
235 \ifx\LT@save@row\LT@@@@save@row
236 \else
237     \LT@warn{Column~ widths~ have~ changed\MessageBreak
238         in~%
239             \tl_if_empty:eTF{\LTcaptype}
240                 {longtable~ \theLT@tables}
241                 {\LTcaptype\c_space_tl\use:c{\the\LTcaptype}}}
242         }
243     \LT@final@warn
244 \fi
```

Force one more go with the `longtable` output routine. Guard the special start of page value of `\pagegoal`.

```
245 \endgraf\penalty -\LT@end@open
246 \ifvoid\LT@foot\else
247     \global\advance\vsizet\LT@foot
248     \global\advance\@colroom\ht\LT@foot
249     \ifdim\pagegoal<\maxdimen
250         \dimen@\pagegoal\advance\dimen@\ht\LT@foot\pagegoal\dimen@
251     \fi
252 \fi
```

Now close the group to return to the standard routine.

```
253 \endgroup
```

Reset `\@mparbottom` to allow marginpars close to the end of the table.<sup>5</sup>

```
254 \global\@mparbottom\z@
255 % \pagegoal\vsizet
256 \endgraf\penalty\z@\addvspace\LTpost
```

Footnotes. As done in the `multicol` package.

```
257 \ifvoid\footins\else\insert\footins{}\fi
258 \UseTaggingSocket{tbl/vmode/end}%
259 }
260 \ExplSyntaxOff
261 \end{document}
```

---

<sup>5</sup>This can not be the correct. However if it is omitted, there is a problem with marginpars, for example on page 3 of this document. Any Output Routine Gurus out there?

..... Page 21 .....

.....longtable.sty.....

## 10.6 Counting Columns

Columns are counted by examining `\@preamble`, rather than simply getting `\@mkpream` to increment the counter as it builds the preamble so that this package works with many of the packages which add extra column specifiers to L<sup>A</sup>T<sub>E</sub>X's standard ones.

Version 1 counted `\@sharp`'s to calculate the number of columns, this was changed for Version 2 as it does not work with the NFSS. Now count &'s. (`lfonts.new` (and now the Standard L<sup>A</sup>T<sub>E</sub>X definition) defines `\@tabclassz` so that `\@sharp` is inside a group.)

`\LT@nofcols` Find the next &, then look ahead to see what is next.

```
262 \def\LT@nofcols#1&{%
263   \futurelet\@let@token\LT@n@fcols}
```

`\LT@n@fcols` Add one, then stop at an `\LT@nofcols` or look for the next &. The `\expandafter` trick was added in Version 3, also the name changed from `\@LT@nofcols` to preserve the `\LT@` naming convention.

```
264 \def\LT@n@fcols{%
265   \advance\LT@cols\@ne
266   \ifx\@let@token\LT@nofcols
267     \expandafter\@gobble
268   \else
269     \expandafter\LT@nofcols
270   \fi}
```

## 10.7 The \\ and \kill Commands

`\LT@tabularcr` The internal definition of `\\"`. In the \* form, insert a `\nobreak` after the next `\cr` (or `\crrc`).

This star form processing was finally added in v4.05. For the previous six or seven years the comment at this point said

This definition also accepts `\\"*`, which acts in the same way as `\\"`. `tabular` does this, but `longtable` probably ought to make `\\"*` prevent page breaking.

`{\ifnum0='}\fi` added in version 3.01, required if the first entry is empty. The above in fact is not good enough, as with `array` package it can introduce a {} group in math mode, which changes the spacing. So use the following variant. Added in v3.14.

```
271 \protected\def\LT@tabularcr{%
272   \relax\iffalse{\fi\ifnum0='}\fi
273   \@ifstar
```

TODO: as we replace `crrc` later in one case, we probably have to implement some further logic there!

```
274   {\def\crrc{\LT@crrc\noalign{\nobreak}}\let\cr\crrc
275   \LT@t@bularcr}%
276   {\LT@t@bularcr}}
```

`\LT@crrc`

```
277 \let\LT@crrc\crrc
```

.....Page 22.....

.....longtable.sty.....

\LT@setprevdepth This will be redefined to set the \prevdepth at the start of a chunk.

278 \let\LT@setprevdepth\relax

\LT@t@bularcr

279 {@@=tbl}  
280 \ExplSyntaxOn  
281 \def\LT@t@bularcr{%

Increment the counter, and do `tabular`'s \\ or finish the chunk.

The `\expandafter` trick was added in Version 3. Set the `\prevdepth` at the start of a new chunk. (Done here so not set in header chunks.)

282 \global\advance\LT@rows\@ne  
283 \ifnum\LT@rows=\LTchunksize

At the end of the chunk \\ is doing something special and so we lose `\tbl_count_missing_cells:n`. Below is about the right place to add it do this code branch.

284 \tbl\_count\_missing\_cells:n {echunk}  
285 \gdef\LT@setprevdepth{  
286 \prevdepth\z@  
287 \global\let\LT@setprevdepth\relax}  
288 \expandafter\LT@xtabularcr  
289 \else  
290 \ifnum0='{} \fi  
291 \expandafter\LT@LL@FM@cr  
292 \fi}  
293 \ExplSyntaxOff  
294 {@@=}

\LT@xtabularcr This just looks for an optional argument.

295 \def\LT@xtabularcr{  
296 @ifnextchar[\LT@argtabularcr\LT@ntabularcr]

\LT@ntabularcr The version with no optional argument. `\ifnum0='{} \fi` added in version 3.01. Changed in 3.14.

297 \def\LT@ntabularcr{  
298 \ifnum0='{} \fi  
299 \LT@echunk  
300 \LT@start  
301 \unvbox\z@  
302 \LT@get@widths  
303 \LT@bchunk}

\LT@argtabularcr The version with an optional argument. `\ifnum0='{} \fi` added in version 3.01. Changed in 3.14.

304 \def\LT@argtabularcr[#1]{  
305 \ifnum0='{} \fi  
306 \ifdim #1>\z@  
307 \unskip\@xargarraycr[#1]  
308 \else  
309 \@yargarraycr[#1]  
310 \fi

Add the dummy row, and finish the `\halign`.

311 \LT@echunk

.....Page 23.....

.....longtable.sty.....

```
312  \LT@start
313  \unvbox\z@
314  \LT@get@widths
315  \LT@bchunk}
```

**\LT@echunk** This ends the current chunk, and removes the dummy row.

```
316 \def\LT@echunk{%
317   \crcr\LT@save@row\cr\egroup
318   \global\setbox\LT@gbox\lastbox
```

The following line was added in v4.05. `longtable` relies on `\lineskip` glue (which is 0pt) to provide break points between each row so the table may be split into pages.

Previous releases left the `\lineskip` glue at the end of each chunk that had been added when the dummy row was added. There was no glue at the start of the next chunk as TeX normally does not put `\lineskip` glue at the top of a box. This meant that normally the chunks fitted together perfectly, however `\noalign` material at a chunk boundary came before the first row of the next chunk but after the `\lineskip` glue at the end of this chunk. This is the wrong place, e.g., it means even a `\penalty10000` does not stop a break as the `\lineskip` glue in the previous item on the list provides a legal breakpoint. So now remove the `\lineskip` glue that was before the dummy row and introduce `\LT@setprevdepth` to set the `\prevdepth` at the start of the next chunk, to make sure `\lineskip` glue is added later.

```
319   \unskip
320   \egroup}
```

**\LT@entry** We here give the ‘basic’ definition of `\LT@entry`, namely that used in alignment templates. It has a `\kern` only if the maximum is imposed from a different chunk. The `\ifhmode` test reveals the first entry, when we don’t want to add an `&`.

```
321 \def\LT@entry#1#2{%
322   \ifhmode\@firstofone{\&}\fi\omit
323   \ifnum#1=\c@LT@chunks
324   \else
325     \kern#2\relax
326   \fi}
```

**\LT@entry@chop** This definition for the argument of `\LT@save@row` is used to scrap all those maxima which could not be verified because they occur after the end of the table. This can happen only if a table has been shortened (or the sequencing got mixed up) since the previous run. Note that this is premature: the last chunk still is going to be set, and with the chopped limits.

```
327 \def\LT@entry@chop#1#2{%
328   \noexpand\LT@entry
329   {\ifnum#1>\c@LT@chunks
330     1}{0pt%
331   \else
332     #1}{#2%
333   \fi}}
```

**\LT@entry@write** To write an entry for the `aux` file, we use a slightly surprising definition which has the sole purpose of avoiding overfull lines (which might break TeX’s limits when

.....Page 24.....

.....longtable.sty.....

reading the `.aux` file, probably you'd need to have a few hundred columns before this happened but...).

```
334 \def\LT@entry@write{%
335   \noexpand\LT@entry^{^J}%
336   \@spaces}
```

`\LT@kill` This ends the current chunk as above, but strips off two rows, the ‘dummy row’ and the ‘killed row’ before starting the next chunk. Since V3.04, the old chunk is reboxed at the start of the box containing the next chunk. This allows `\kill` to be used in headers, which must be processed in a single box.

```
337 \def\LT@kill{%
338   \LT@echunk
339   \LT@get@widths
340   \expandafter\LT@rebox\LT@bchunk}
```

`\LT@rebox` Drop the old chunk (`box0`) back at the top of the new chunk, removing the killed row. This macro added at V3.04.

```
341 \def\LT@rebox#1\bgroupp{%
342   #1\bgroupp
343   \unvbox\z@
344   \unskip
345   \setbox\z@\lastbox}
```

## 10.8 The Dummy Row

The dummy row is kept inside of the macro `\LT@save@row`.

`\LT@blank@row` Create a blank row if we are not using the info in the `.aux` file.

```
\LT@build@blank 346 \def\LT@blank@row{%
347   \xdef\LT@save@row{\expandafter\LT@build@blank
348   \romannumeral\number\LT@cols 001 }}
```

Whoops! What's that supposed to be? A drop-in replacement for the first task of Appendix D in the `TeXbook`. The `\romannumeral` produces `\LT@cols` instances of `m` followed by `i`. The below macro then replaces the `ms` by appropriate entries.

```
349 \def\LT@build@blank#1{%
350   \if#1m%
351     \noexpand\LT@entry{1}{0pt}%
352     \expandafter\LT@build@blank
353   \fi}
```

`\LT@make@row` Prior to version 4, by default did not use information in the `.aux` file but now we can define `\LT@make@row` to use the `.aux` file, even on the ‘draft’ passes.

```
354 \def\LT@make@row{%
355   \global\expandafter\let\expandafter\LT@save@row
356   \csname LT@romannumeral\c@LT@tables\endcsname
357   \ifx\LT@save@row\relax
358     \LT@blank@row
```

Now a slightly difficult part comes. Before we decide making the template from the `.aux` file info we check that the number of fields has remained the same. If it hasn't, either the table format has changed, or we have the wrong table altogether. In both cases, we decide to better drop all gathered information and start over.

.....Page 25.....

.....longtable.sty.....

The expansion between !...! below will be empty if the number of \LT@entry macros including arguments in \LT@save@row is equal to \LT@cols. If it is not empty, we throw the row away and start from scratch.

```
359  \else
360    {\let\LT@entry\or
361     \if!%
362       \ifcase\expandafter\expandafter\expandafter\LT@cols
363         \expandafter\@gobble\LT@save@row
364       \or
365       \else
366         \relax
367       \fi
368       !%
369     \else
370       \aftergroup\LT@blank@row
371     \fi}%
372 \fi}
```

**\setlongtables** Redefine \LT@make@row to use information in the .aux file, if there is a saved row for this table with the right number of columns.

Since Version 3.02, longtable has used the internal counter \c@LT@tables rather than the L<sup>A</sup>T<sub>E</sub>X counter table. The warning message was added at V3.04, as was the \global, to stop save-stack overflow.

Since Version 4.01 \setlongtables does nothing as it is not needed, but is defined as \relax for the benefit of old documents.

```
373 \let\setlongtables\relax
```

**\LT@get@widths** This is the heart of longtable. If it were not for the table head and foot, this macro together with the modified \\ command would form the basis of quite a simple little package file for long tables. It is closely modelled on the \endvrulealign macro of appendix D of the T<sub>E</sub>Xbook.

```
374 \def\LT@get@widths{%
```

\global added at V3.04, to stop save-stack overflow.

Loop through the last row, discarding glue, and saving box widths. At V3.04 changed the scratch box to 2, as the new \kill requires that \box0 be preserved.

```
375  \setbox\tw@\hbox{%
376    \unhbox\LT@gbox
377    \let\LT@old@row\LT@save@row
378    \global\let\LT@save@row\@empty
379    \count@0\LT@cols
380    \loop
381      \unskip
382      \setbox\tw@\lastbox
383      \ifhbox\tw@
384        \LT@def@row
385        \advance\count@\m@ne
386      \repeat}%
387 \ifx\LT@@save@row\@undefined
388   \let\LT@@save@row\LT@save@row
389 \fi}
```

Remember the widths if we are in the first chunk.

```
387 \ifx\LT@@save@row\@undefined
388   \let\LT@@save@row\LT@save@row
389 \fi}
```

.....Page 26.....

.....longtable.sty.....

**\LT@def@row** Add a column to the dummy row. Name changed from `\defLT@save@row` in Version 3, to preserve the `\LT@` naming convention.

390 `\def\LT@def@row{%`

We start by picking the respective entry from our old row. These redefinitions of `\LT@entry` are local to the group started in `\LT@get@widths`.

```
391  \let\LT@entry\or
392  \edef\@tempa{%
393    \ifcase\expandafter\count@\LT@old@row
394    \else
395      {1}{\Opt}%
396    \fi}%
397  \let\LT@entry\relax
398  \xdef\LT@save@row{%
399    \LT@entry
400    \expandafter\LT@max@sel\@tempa
401    \LT@save@row}}
```

Now we tack the right combination in front of `\LT@save@row`:

```
397  \let\LT@entry\relax
398  \xdef\LT@save@row{%
399    \LT@entry
400    \expandafter\LT@max@sel\@tempa
401    \LT@save@row}}
```

**\LT@max@sel** And this is how to select the right combination. Note that we take the old maximum information only if the size does not change in *either* direction. If the size has grown, we of course have a new maximum. If the size has shrunk, the old maximum (which was explicitly not enforced because of being in the current chunk) is invalid, and we start with this chunk as the new size. Note that even in the case of equality we *must* use the `\the\wd\tw@` construct instead of #2 because #2 might be read in from the file, and so could have \catcode 11 versions of p and t in it which we want to be replaced by their ‘proper’ \catcode 12 versions.

```
402 \def\LT@max@sel#1#2{%
403   \ifdim#2=\wd\tw@
404     #1%
405   \else
406     \number\c@LT@chunks
407   \fi}%
408 {\the\wd\tw@}}
```

## 10.9 The `\hline` Command

**\LT@hline** `\hline` and `\hline\hline` both produce *two* lines. The only difference being the glue and penalties between them. This is so that a page break at a `\hline` produces a line on both pages.<sup>6</sup> Also this `\hline` is more like a `\cline{1-\LT@cols}`. `tabular`’s `\hline` would draw lines the full width of the page.

```
409 \def\LT@hline{%
410   \noalign{\ifnum0='}\fi
411   \penalty\OM
412   \futurelet\@let@token\LT@@hline}
```

**\LT@@hline** This code is based on `\cline`. Two copies of the line are produced, as described above.

413 `\LT@@hline`

<sup>6</sup>`longtable` has always done this, but perhaps it would be better if `hlines` were *omitted* at a page break, as the head and foot usually put a `hline` here anyway.

.....Page 27.....

.....longtable.sty.....

```
414 \ExplSyntaxOn
415 \def\LT@0@@hline{%
416   \ifx\@let@token\hline
417     \global\let\@gtempa\@gobble
418     \gdef\LT@sep{\penalty-\@medpenalty\vskip\doublerulesep}%
419   \else
420     \global\let\@gtempa\@empty
421     \gdef\LT@sep{\penalty-\@lowpenalty\vskip-\arrayrulewidth}%
422   \fi
423   \ifnum0=\{\fi}%
424   \multispan\LT@cols
425     \unskip\leaders\hrule\@height\arrayrulewidth\hfill\cr
```

Don't update the row counter, or rather undo the update done in `\everycr`:

```
426   \noalign{%
427     \tbl_gdecr_row_count:
428     \LT@sep
429   \multispan\LT@cols
430     \unskip\leaders\hrule\@height\arrayrulewidth\hfill\cr
```

Same here.

```
431   \noalign{%
432     \tbl_gdecr_row_count:
433     \penalty\@M}
434   \@gtempa}
435 \relax
```

## 10.10 Captions

`\LT@caption` The caption is `\multicolumn{\LT@cols}{c}{<a parbox with the table's caption>}`

```
436 \def\LT@caption{%
437   \noalign\begin{group}
438     \ifnextchar[\egroup\LT@caption\@firstofone\LT@caption}
```

`\LT@caption` Caption command (with [optional argument]). `\protect` added in Version 3.

`\fnum@table` added at V3.05.

```
439 \def\LT@caption#1[#2]#3{%
440   \tl_if_empty:eTF{\LTcaptype}
441     {\LT@makecaption\@gobble{}{#3}}
442     {\LT@makecaption#1{\csname fnum@\LTcaptype\endcsname}{#3}}
443   \def\@tempa{#2}
444   \ifx\@tempa\@empty\else
445     \let\\space
446     \addcontentsline
447       {\@nameuse{ext@\LTcaptype}}
448       {\LTcaptype}
449       {\protect\numberline{\@nameuse{the\LTcaptype}}{#2}}}
450   \fi}
451 \ExplSyntaxOff
```

`\LT@caption` Caption command (no [optional argument])

```
452 \def\LT@caption{%
453   \ifstar
454     {\egroup\LT@caption\@gobble[]}%
455     {\egroup\@xdblarg{\LT@caption\@firstofone}}}
```

.....Page 28.....

.....longtable.sty.....

\LT@makecaption Put the caption in a box of width 0pt, so that it never affects the column widths. Inside that is a \parbox of width \LTcapwidth.

```
456 \def\LT@makecaption#1#2#3{%
457   \LT@mcoll\LT@cols c{\hbox to\z@{\hss\parbox[t]\LTcapwidth{%
```

Based on article class \makecaption, #1 is \gobble in star form, and \firstofone otherwise.

```
458   \reset@font
459   \sbox\@tempboxa{#1{#2: }#3}%
460   \ifdim\wd\@tempboxa>\hsize
461     #1{#2: }#3%
462   \else
463     \hbox to\hsize{\hfil\box\@tempboxa\hfil}%
464   \fi
465   \endgraf\vskip\baselineskip}%
466 \hss}}}
```

## 10.11 The Output Routine

The method used here for interfacing a special purpose output routine to the standard L<sup>A</sup>T<sub>E</sub>X routine is lifted straight out of F. Mittelbach's *multicol* package.

\LT@output Actually this is not so bad, with FM leading the way.

```
467 \ExplSyntaxOn
468 \def\LT@output{%
469   \ifnum\outputpenalty <-\@Mi
470   \ifnum\outputpenalty > -\LT@end@pen
```

If this was a float or a marginpar we complain.

```
471   \LT@err{floats~ and~ marginpars~ not~ allowed~ in~ a~ longtable}\@ehc
472   \else
```

We have reached the end of the table, on the scroll at least,

```
473   \setbox\z@\vbox{\unvbox\@cclv}%
474   \ifdim \ht\LT@lastfoot>\ht\LT@foot
```

The last foot might not fit, so:<sup>7</sup>

```
475   \dimen@\pagegoal
476   \advance\dimen@\ht\LT@foot
477   \advance\dimen@-\ht\LT@lastfoot
478   \ifdim\dimen@<\ht\z@
479     \setbox\@cclv\vbox{\unvbox\z@\copy\LT@foot\vskip\z@\@plus1fil\@minus\normalbaseline
480     \v@makecol
481     \v@expl@@@mark@update@singlecol@structures@@
482     \v@outputpage
483     \global\vsize@\colroom
484     \setbox\z@\vbox{\box\LT@head}%

```

End of \ifdim\dimen@<\ht\@cclv.

```
485   \fi
```

End of \ifdim \ht\LT@lastfoot > \ht\LT@foot.

```
486   \fi
```

---

<sup>7</sup>An alternative would be to vsplit off a bit of the last chunk, so that the last page did not just have head and foot sections, but it is hard to do this in a consistent manner.

.....longtable.sty.....

```
Reset \@colroom.  
487 \% \global\@colroom\@colht  
488 \% \global\vsiz\@colht  
Put the last page of the table on to the main vertical list.  
489 \unvbox\z@\box\ifvoid\LT@lastfoot\LT@foot\else\LT@lastfoot\fi  
Handle foot box when tagging:  
490 \UseTaggingSocket{tbl/longtable/foot}  
End of \ifnum\outputpenalty > -\LT@end@pen.  
491 \fi  
Else \outputpenalty > -\@Mi.  
492 \else  
If we have not reached the end of the table,  
493 \setbox\@cclv\vbox{\unvbox\@cclv\copy\LT@foot\vskip\z@\@plus1fil\@minus\normalbaselineskip  
Handle foot box when tagging:  
494 \UseTaggingSocket{tbl/longtable/foot}  
495 \@makecol  
496 \@expl@@@mark@update@singlecol@structures@  
497 \@outputpage  
Reset \vsiz.  
498 \global\vsiz\@colroom  
Put the head at the top of the next page.  
499 \copy\LT@head\nobreak  
End of \ifnum\outputpenalty <-\@Mi.  
500 \fi}  
501 \ExplSyntaxOff  
502 \end{document}
```

## 10.12 Commands for the table head and foot

\LT@end@hd@ft The core of \endhead and friends. Store the current chunk in the box specified by #1. Issue an error if the table has already started. Then start a new chunk.

```
503 \ExplSyntaxOn  
504 \def\LT@end@hd@ft#1{  
505 }
```

This command is used to store the head and foot boxes. We need to retrieve and store the row so that we can clean up the structure in the finalize code.

To handle missing columns in the header we need this:

```
506 \tbl_if_row_was_started:TF  
507 {
```

TODO: This is exposing internal counters, so it should be encapsulated in some interface command (but I'm not sure what that should be called, so not done yet).

```
508 \tbl_count_missing_cells:n {head/foot}  
509 \int_step_inline:nn  
510 { \LT@rows + 1 }  
511 {
```

.....Page 30.....

.....longtable.sty.....

```
512     \seq_gput_left:ce
513     {g_@@_\cs_to_str:N #1 _rows_seq }
514     { \int_eval:n {\g_@@_row_int + 1 - ##1 } }
515 }
```

We also have to set the chunk rows to its max value before calling `\LT@echunk` so that we don't get extra increments of the main row counter due to `\everycr`.

```
516     \int_gset:Nn \LT@rows { \LTchunksize }
517 }
```

If we are still in column zero then we had an empty `\endhead` and so making any assignment, etc., would start a row — something we don't want. To get out of this trap we run `\crcr` (which would normally come inside `\LT@echunk`). That will then trigger `\everycr` and update row counter unnecessarily, but now we have a defined state, so we can use `\noalign` to undo that. We also change `\LT@rows` so that further `\crs` do not do any harm (as explained above).

The `\crcr` inside `\LT@echunk` will be bypassed in that case as we have just executed a `\crcr` and are still in scanning modus for `\omit` or `\noalign`.

```
518     {
519     \crcr
520     \noalign{
521     \int_step_inline:nn
522     { \LT@rows }
523     {
524     \seq_gput_left:ce
525     {g_@@_\cs_to_str:N #1 _rows_seq }
526     { \int_eval:n {\g_@@_row_int - ##1 } }
527     }
528     \tbl_gdecr_row_count: % undo the increment
529     \int_gset:Nn \LT@rows { \LTchunksize }
530     }
531   }
532 \LT@echunk
```

Changed from `\relax` to `\endgraf` at V3.04, see `\LT@start`.

```
533 \ifx\LT@start\endgraf
534   \LT@err
535   {Longtable~ head~ or~ foot~ not~ at~ start~ of~ table}%
536   {Increase~ LTchunksize}%
537 \fi
538 \setbox#1\box\z@
539 \@@_trace:n {-->~ Saving~\noexpand#1}
540 \LT@get@widths
541 \LT@bchunk
542 \ExplSyntaxOff
543 \CQ=
```

`\endfirsthead` Call `\LT@end@hd@ft` with the appropriate box.

```
\endhead 544 \def\endfirsthead{\LT@end@hd@ft\LT@firsthead}
\endfoot 545 \def\endhead{\LT@end@hd@ft\LT@head}
\endlastfoot 546 \def\endfoot{\LT@end@hd@ft\LT@foot}
547 \def\endlastfoot{\LT@end@hd@ft\LT@lastfoot}
```

.....Page 31.....

.....longtable.sty.....

### 10.13 The `\multicolumn` command

Earlier versions needed a special ‘draft’ form of `\multicolumn`. This is not needed in version 4, and so these commands have been removed.

```
\LT@multicolumn
```

```
\LT@mcwarn
```

### 10.14 Footnotes

The standard `\footnote` command works in a `c` column, but we need to modify the definition in a `p` column to overcome the extra level of boxing. These macros are based on the `array` package, but should be OK for the standard `tabular`.

`\LT@startpbox` Add extra code to switch the definition of `\@footnotetext`.

```
548 \def\LT@startpbox#1{%
549   \bgroup
550   \color@begingroup
551   \let\@footnotetext\LT@p@ftntext
552   \setlength\hsize{#1}%
553   \arrayparboxrestore
554   \everypar{%
555     \vrule \height \ht\@arstrutbox \width \z@%
556     \everypar{}%}
557 }
```

`\LT@endpbox` After the parbox is closed, expand `\LT@p@ftn` which will execute a series of `\footnotetext[<num>]{<note>}` commands. After being lifted out of the parbox, they can migrate on their own from here.

```
558 \def\LT@endpbox{%
559   \finalstrut\@arstrutbox
560   \color@endgroup
561   \egroup
562   \the\LT@p@ftn
563   \global\LT@p@ftn{}%
564   \hfil}
```

`\LT@p@ftntext` Inside the ‘p’ column, just save up the footnote text in a token register.

```
565 \long\def\LT@p@ftntext#1{%
566   \edef\@tempa{\the\LT@p@ftn\noexpand\footnotetext[\the\c@footnote]}%
567   \global\LT@p@ftn\expandafter{\@tempa{#1}}%
```

### 10.15 Supporting hooks

Since `longtable` is supposed to work without loading `array`, i.e., just with the `tabular` code from the kernel and that code has no hooks. We therefore do not run any hook if `array` is not loaded, because otherwise those explicitly used in the `longtable` code would run, but the corresponding ones that are only in the `array` code are not. By default we assume `array` is not loaded.

```
568 \let \ArrayLoadedT \gobble
```

.....Page 32.....

.....longtable.sty.....

If it is we change and the hooks get executed.

```
569 \AddToHook{package/array/after}{\let \ArrayLoadedT \@firstofone}
```

## 10.16 Tagging support

Some variables need for the tagging support.

```
570 <@@=tbl>
571 \ExplSyntaxOn
572   \seq_new:N \g_@@_LT@firsthead_rows_seq
573   \seq_new:N \g_@@_LT@head_rows_seq
574   \seq_new:N \g_@@_LT@lastfoot_rows_seq
575   \seq_new:N \g_@@_LT@foot_rows_seq
576 \ExplSyntaxOff
577 <@@=>
578 </package>
```

.....Page 33.....