

The longtable package*

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<https://latex-project.org/bugs.html>.

Abstract

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

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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_EX's standard page-breaking algorithm. It also shares some features with the `table` environment. In particular it uses 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 8.

Note: Various parts of the following table will **not** line up correctly until this document has been run through L^AT_EX several times. This is a characteristic feature of this package, as described below.

*This file has version number v4.17, last revised 2021-09-01.

†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: (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 T _E X will never break a page within such a row. Page breaks only occur between rows of the table or at <code>\hline</code> 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 ¹ of lines	like this. *
* Lots of lines	like this ² *
* Lots of lines	like this. *
* Lots of lines	like this. *
* These lines will	appear *
* in place of the	usual foot *
* at the end	of the table *

2 Chunk Size

`LTchunksize` In order to T_EX multi-page tables, it is necessary to break up the table into smaller chunks, so that T_EX 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}`.³ These chunks do not affect page breaking, thus if you are using a T_EX with a lot of memory, you can set `LTchunksize` to be several pages of the table. T_EX will run faster with a large `LTchunksize`.

¹This is a footnote.

²`longtable` takes special precautions, so that footnotes may also be used in ‘p’ columns.

³You can also use the plain T_EX syntax `\LTchunksize=10`.

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 \LaTeX you will see that various parts of the table do not line up. \LaTeX 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, using a new algorithm⁴ and so `\setlongtables` is no longer needed. It is defined (but does nothing) for the benefit of old documents that use it.

3 Captions and Headings

At the start of the table one may specify lines which are to appear at the top of every page (under the headline, but before the other lines of the table). The lines are entered as normal, but the last `\` 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 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.

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

⁴Due to David Kastrop.

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.

4 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 `LTchunksiz` 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 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 `LATEX` 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

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

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^AT_EX-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.

5 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
\LTRight
\setlength\LTleft\parindent
\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{...}}...}
```

6 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^AT_EX.
- 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.

7 Summary

Table 7: A summary of longtable commands

Parameters	
<code>\LTleft</code>	Glue to the left of the table. (\fill)
<code>\LTright</code>	Glue to the right of the table. (\fill)
<code>\LTpre</code>	Glue before the table. (\bigskipamount)
<code>\LTpost</code>	Glue after the table. (\bigskipamount)
<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>\\[<i><dim></i>]</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 the first page.
<code>\endfoot</code>	Specifies rows to appear at the bottom of every page.
<code>\endlastfoot</code>	Specifies rows to appear at the bottom of the last page.
longtable caption commands	
<code>\caption{<i><caption></i>}</code>	Caption ‘Table ?: <i><caption></i> ’, and a ‘ <i><caption></i> ’ entry in the list of tables.
<code>\caption[<i><lot></i>]{<i><caption></i>}</code>	Caption ‘Table ?: <i><caption></i> ’, and a ‘ <i><lot></i> ’ entry in the list of tables.
<code>\caption[]{<i><caption></i>}</code>	Caption ‘Table ?: <i><caption></i> ’, but no entry in the list of tables.
<code>\caption*{<i><caption></i>}</code>	Caption ‘ <i><caption></i> ’, 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	
<code>\footnote</code>	Footnotes, but may not be used in the table head & foot.
<code>\footnotemark</code>	Footnotemark, may be used in the table head & foot.
<code>\footnotetext</code>	Footnote text, use in the table body.
Setlongtables	
<code>\setlongtables</code>	Obsolete command. Does nothing now.

8 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}
```

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9 The Macros

1 (*package)

9.1 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}`

9.2 Options

The first two options deal with error handling. They are compatible with the options used by the `tracefmt` 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`

9.3 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`

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`\c@LTchunks` Added in V3.07 to allow the L^AT_EX syntax `\setcounter{LTchunks}{10}`.
21 `\let\c@LTchunks\LTchunks`

`\LTcapwidth` Width of the `\parbox` containing the caption. Default 4in.
22 `\newdimen\LTcapwidth \LTcapwidth=4in`

9.4 Internal Parameters

`\LT@head` Boxes for the table head and foot.
`\LT@firsthead` 23 `\newbox\LT@head`
`\LT@foot` 24 `\newbox\LT@firsthead`
`\LT@lastfoot` 25 `\newbox\LT@foot`
26 `\newbox\LT@lastfoot`

`\LT@gbox`
27 `\newbox\LT@gbox`

`\LT@cols` Counter for number of columns.
28 `\newcount\LT@cols`

`\LT@rows` Counter for rows up to chunksize.
29 `\newcount\LT@rows`

`\c@LT@tables` Counter for the tables, added in V3.02. Previous versions just used the L^AT_EX 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. L^AT_EX 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.

30 `\newcounter{LT@tables}`

`\c@LT@chunks` We need to count through the chunks of our tables from Version 4 on.
31 `\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` 32 `\ifx\c@table\undefined`
`\ext@table` 33 `\newcounter{table}`
34 `\def\fnum@table{\tablename~\thetable}`
35 `\fi`
36 `\ifx\tablename\undefined`
37 `\def\tablename{Table}`
38 `\fi`
39 `\ifx\ext@table\undefined`
40 `\def\ext@table{lot}`
41 `\fi`

`\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.

`\ifx\startlabels\undefined`

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```
\let\@auxout\@auxout
\else
  {\@input{\jobname.lta}}%
  \newwrite\@auxout
  \immediate\openout\@auxout=\jobname.lta
\fi
```

`\LT@p@ftn` Temporary storage for footnote text in a ‘p’ column.
42 `\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.
43 `\mathchardef\LT@end@pen=30000`

9.5 The longtable environment

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

```
44 \def\longtable{%
45   \par
46   \if@noskipsec\mbox{}\par\fi
47   \@nobreakfalse
48   \ifx\multicols\@undefined
49   \else
50     \ifnum\col@number>\@ne
51       \@twocolumntrue
52     \fi
53   \fi
54   \if@twocolumn
55     \LT@err{longtable not in 1-column mode}\@ehc
56   \fi
57   \begingroup
```

Check for an optional argument.

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

`\LT@array` Start setting the alignment. Based on `\@array` from the \LaTeX kernel and the `array` package.

Since Version 3.02, `longtable` has used the internal counter `\c@LT@tables`. The \LaTeX counter `table` is still incremented so that `\caption` works correctly.

```
59 \def\LT@array[#1]#2{%
60   \refstepcounter{table}\stepcounter{LT@tables}%
```

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

```
61 \if l#1%
62   \LTleft\z@ \LTright\fill
63 \else\if r#1%
64   \LTleft\fill \LTright\z@
65 \else\if c#1%
66   \LTleft\fill \LTright\fill
67 \fi\fi\fi
```

Set up these internal commands for `longtable`.

```
\global\let\LT@mcw@rn\relax
```

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```
68 \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.

```
69 \let\LT@@tabarray\@tabarray
70 \let\LT@@hl\hline
71 \def\@tabarray{%
72   \let\hline\LT@@hl

   \let\multicolumn\LT@mcol

73   \LT@@tabarray}%
74 \let\\LT@tabularcr\let\tabularnewline\\%
75 \def\newpage{\noalign{\break}}%
```

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

```
76 \def\pagebreak{\noalign{\ifnum' }=0\fi\@testopt{\LT@no@pgbk-}4}%
77 \def\nopagebreak{\noalign{\ifnum' }=0\fi\@testopt{LT@no@pgbk4}%
78 \let\hline\LT@hline \let\kill\LT@kill\let\caption\LT@caption
79 \@tempdima\ht\strutbox
80 \let\@endpbox\LT@endpbox
```

Set up internal commands according to Lamport or Mittelbach.

```
81 \ifx\extrarowheight\@undefined
```

Initialise these commands as in tabular from the L^AT_EX kernel.

```
82 \let\@acol\@tabacol
83 \let\@classz\@tabclassz \let\@classiv\@tabclassiv
84 \def\@startpbox{\vtop\LT@startpbox}%
85 \let\@startpbox\@startpbox
86 \let\@endpbox\@endpbox
87 \let\LT@LL@FM@cr\@tabularcr
88 \else
```

Initialise these commands as in array. \d@llar replaced by \d@llarbegin \d@llarend in V3.03 to match array V2.0h. We do not need to set \d@llarbegin and \d@llarend as the array package gives them the correct values at the top level.

```
89 \advance\@tempdima\extrarowheight
90 \col@sep\tabcolsep
91 \let\@startpbox\LT@startpbox\let\LT@LL@FM@cr\@arraycr
92 \fi
```

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

```
93 \setbox\@arstrutbox\hbox{\vrule
94   \@height \arraystretch \@tempdima
95   \@depth \arraystretch \dp \strutbox
96   \@width \z@}%
97 \let\@sharp#\let\protect\relax
```

Interpret the preamble argument.

```
98 \begingroup
99 \mkpream{#2}%
```

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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!

```
100   \xdef\LT@bchunk{%
101     \global\advance\c@LT@chunks\@ne
102     \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 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.

```
103     \LT@setprevdepth
104     \tabskip\LTleft \noexpand\halign to\hsize\bgroup
105 %     \tabskip\LTleft\halign to\hsize\bgroup
106     \tabskip\z@ \@arstrut \@preamble \tabskip\LTRight \cr}%
107 \endgroup
```

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

```
108 \expandafter\LT@nofcols\LT@bchunk&\LT@nofcols
```

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

```
109 \LT@make@row
```

A few more internal commands for longtable.

```
110 \m@th\let\par\@empty
111 \everycr{}\lineskip\z@\baselineskip\z@
```

Start the first chunk.

```
112 \LT@bchunk}
```

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

```
113 \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.

```
114 \def\LT@start{%
115   \let\LT@start\endgraf
116   \endgraf\penalty\z@\vskip\LTpre\endgraf
```

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

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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 T_EX 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 synchronizing with typesetting, as part of the preparations for switching output routine), but it's OK. Perhaps XOR will make it better.

```
117 \ifdim \pagetotal<\pagegoal \else
118     \dimen@=\pageshrink
119     \advance \dimen@ 1sp %
120     \kern\dimen@\penalty 9999\endgraf \kern-\dimen@
121 \fi
```

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

```
122 \dimen@\pagetotal
123 \advance\dimen@ \ht\ifvoid\LT@firsthead\LT@head\else\LT@firsthead\fi
124 \advance\dimen@ \dp\ifvoid\LT@firsthead\LT@head\else\LT@firsthead\fi
125 \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 `\vsplitting` it out of the first chunk.

```
126 \edef\LT@reset@vfuzz{\vfuzz\the\vfuzz\vbadness\the\vbadness\relax}%
127 \vfuzz\maxdimen
128 \vbadness\@M
129 \setbox\tw@\copy\z@
130 \setbox\tw@\vsplit\tw@ to \ht\@arstrutbox
131 \setbox\tw@\vbox{\unvbox\tw@}%
132 \LT@reset@vfuzz
133 \advance\dimen@ \ht
134     \ifdim\ht\@arstrutbox>\ht\tw@\@arstrutbox\else\tw@\fi
135 \advance\dimen@\dp
136     \ifdim\dp\@arstrutbox>\dp\tw@\@arstrutbox\else\tw@\fi
137 \advance\dimen@ -\pagegoal
138 \ifdim \dimen@>\z@
139     \vfil\break
140 \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.

```
141 \ifdim\pageshrink>\z@\pageshrink\z@\fi
142 \fi
```

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

```
143 \global\@colroom\@colht
```

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

```

144 \ifvoid\LT@foot\else
145 %   \advance\vsize-\ht\LT@foot
146   \global\advance\vsize-\ht\LT@foot
147   \global\advance\@colroom-\ht\LT@foot
148   \dimen@\pagegoal\advance\dimen@-\ht\LT@foot\pagegoal\dimen@
149   \maxdepth\z@
150 \fi

```

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

```

151 \ifvoid\LT@firsthead\copy\LT@head\else\box\LT@firsthead\fi\nobreak
152 \output{\LT@output}

```

\endlongtable Called by \end{longtable}.

```

153 \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.

```

154 \crrc
155 \noalign{%
156   \let\LT@entry\LT@entry@chop
157   \xdef\LT@save@row{\LT@save@row}}%
158 \LT@echunk
159 \LT@start
160 \unvbox\z@
161 \LT@get@widths

```

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

```

162 \if@filesw
163   {\let\LT@entry\LT@entry@write\immediate\write\@auxout{%

```

Since Version 3.02, longtable has used the internal counter \c@LT@tables rather than the L^AT_EX 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.

```

164   \gdef\expandafter\noexpand
165     \csname LT@romannumeral\c@LT@tables\endcsname
166     {\LT@save@row}}}%
167 \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^AT_EX at the end of the document.

```

168 \ifx\LT@save@row\LT@save@row
169 \else
170   \LT@warn{Column \@width s have changed\MessageBreak
171           in table \thetable}%

```

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```
172 \LT@final@warn
173 \fi
Force one more go with the longtable output routine.
174 \endgraf\penalty -\LT@end@pen
175 \ifvoid\LT@foot\else
176 \global\advance\vsizelt\LT@foot
177 \global\advance\colroom\ht\LT@foot
178 \dimen@pagegoal\advance\dimen@ht\LT@foot\pagegoal\dimen@
179 \fi
```

Now close the group to return to the standard routine.

```
180 \endgroup
Reset \@mparbottom to allow marginpars close to the end of the table.5
```

```
181 \global\@mparbottom\z@
182 % \pagegoal\vsizelt
183 \endgraf\penalty\z@\addvspace\LTpost
```

Footnotes. As done in the multicol package.

```
184 \ifvoid\footins\else\insert\footins{}\fi}
```

9.6 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^AT_EX'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. (lfont.new (and now the Standard L^AT_EX definition) defines \@tabclassz so that \@sharp is inside a group.)

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

```
185 \def\LT@nofcols#1&{%
186 \futurelet\@let@token\LT@nofcols}
```

\LT@nofcols 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.

```
187 \def\LT@nofcols{%
188 \advance\LT@cols\@ne
189 \ifx\@let@token\LT@nofcols
190 \expandafter\@gobble
191 \else
192 \expandafter\LT@nofcols
193 \fi}
```

⁵This 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?

9.7 The `\` and `\kill` Commands

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

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.

```
194 \protected\def\LT@tabularcr{%
195   \relax\iffalse{\fi\ifnum0=‘}\fi
196   \@ifstar
197     {\def\crrcr{\LT@crrcr\noalign{\nobreak}}\let\cr\crrcr
198     \LT@t@bularcr}%
199   {\LT@t@bularcr}}
```

`\LT@crrcr`

```
200 \let\LT@crrcr\crrcr
```

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

```
201 \let\LT@setprevdepth\relax
```

`\LT@t@bularcr`

```
202 \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).
203   \global\advance\LT@rows\@ne
204   \ifnum\LT@rows=\LT@chunksiz
205     \gdef\LT@setprevdepth{%
206       \prevdepth\z@
207       \global\let\LT@setprevdepth\relax}%
208     \expandafter\LT@xtabularcr
209   \else
210     \ifnum0=‘}\fi
211     \expandafter\LT@LL@FM@cr
212   \fi}
```

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

```
213 \def\LT@xtabularcr{%
214   \@ifnextchar[\LT@argtabularcr\LT@ntabularcr}
```

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

```
215 \def\LT@ntabularcr{%
216   \ifnum0=‘}\fi
217   \LT@echunk
218   \LT@start
```

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```
219 \unvbox\z@
220 \LT@get@widths
221 \LT@bchunk}
```

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

```
222 \def\LT@argtabularcr[#1]{%
223 \ifnum0={\fi
224 \ifdim #1>\z@
225 \unskip\@xargarraycr{#1}%
226 \else
227 \@yargarraycr{#1}%
228 \fi
```

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

```
229 \LT@echunk
230 \LT@start
231 \unvbox\z@
232 \LT@get@widths
233 \LT@bchunk}
```

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

```
234 \def\LT@echunk{%
235 \crrc\LT@save@row\cr\egroup
236 \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.

```
237 \unskip
238 \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 `&`.

```
239 \def\LT@entry#1#2{%
240 \ifhmode\@firstofone{&}\fi\omit
241 \ifnum#1=\c@LT@chunks
242 \else
243 \kern#2\relax
244 \fi}
```

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`\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.

```
245 \def\LT@entry@chop#1#2{%
246   \noexpand\LT@entry
247   {\ifnum#1>\c@LT@chunks
248     1}{Opt%
249     \else
250     #1}{#2%
251     \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 reading the `aux` file, probably you'd need to have a few hundred columns before this happened but...).

```
252 \def\LT@entry@write{%
253   \noexpand\LT@entry^^J%
254   \@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.

```
255 \def\LT@kill{%
256   \LT@echunk
257   \LT@get@widths
258   \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.

```
259 \def\LT@rebox#1\bgroup{%
260   #1\bgroup
261   \unvbox\z@
262   \unskip
263   \setbox\z@\lastbox}
```

9.8 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 264 \def\LT@blank@row{%
265   \xdef\LT@save@row{\expandafter\LT@build@blank
266     \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.

```
267 \def\LT@build@blank#1{%
268   \if#1m%
```

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```
269 \noexpand\LT@entry{1}{0pt}%
270 \expandafter\LT@build@blank
271 \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.

```
272 \def\LT@make@row{%
273 \global\expandafter\let\expandafter\LT@save@row
274 \csname LT@romannumeral@c@LT@tables\endcsname
275 \ifx\LT@save@row\relax
276 \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.

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.

```
277 \else
278 {\let\LT@entry\or
279 \if!%
280 \ifcase\expandafter\expandafter\expandafter\LT@cols
281 \expandafter@gobble\LT@save@row
282 \or
283 \else
284 \relax
285 \fi
286 !%
287 \else
288 \aftergroup\LT@blank@row
289 \fi}%
290 \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^AT_EX 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.

```
291 \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_EXbook.

```
292 \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.

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```
293 \setbox\tw@\hbox{%
294   \unhbox\LT@gbox
295   \let\LT@old@row\LT@save@row
296   \global\let\LT@save@row\@empty
297   \count@\LT@cols
298   \loop
299     \unskip
300     \setbox\tw@\lastbox
301     \ifhbox\tw@
302       \LT@def@row
303       \advance\count@\m@ne
304     \repeat}%
```

Remember the widths if we are in the first chunk.

```
305 \ifx\LT@save@row\undefined
306   \let\LT@save@row\LT@save@row
307 \fi}
```

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

```
308 \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`.

```
309 \let\LT@entry\or
310 \edef\@tempa{%
311   \ifcase\expandafter\count@\LT@old@row
312   \else
313     {1}{Opt}%
314   \fi}%
```

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

```
315 \let\LT@entry\relax
316 \xdef\LT@save@row{%
317   \LT@entry
318   \expandafter\LT@max@sel\@tempa
319   \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.

```
320 \def\LT@max@sel#1#2{%
321   {\ifdim#2=\wd\tw@
322     #1%
323   \else
324     \number\c@LT@chunks
325   \fi}%
326 {\the\wd\tw@}}
```

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9.9 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.⁶ Also this `\hline` is more like a `\cline{1-\LT@cols}`. `tabular`'s `\hline` would draw lines the full width of the page.

```
327 \def\LT@hline{%
328   \noalign{\ifnum0='}\fi
329   \penalty\@M
330   \futurelet\@let@token\LT@@hline}
```

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

```
331 \def\LT@@hline{%
332   \ifx\@let@token\hline
333     \global\let\@gtempa\@gobble
334     \gdef\LT@sep{\penalty-\@medpenalty\vskip\doublerulesep}%
335   \else
336     \global\let\@gtempa\@empty
337     \gdef\LT@sep{\penalty-\@lowpenalty\vskip-\arrayrulewidth}%
338   \fi
339   \ifnum0='{\fi}%
340   \multispan\LT@cols
341     \unskip\leaders\hrule\@height\arrayrulewidth\hfill\cr
342   \noalign{\LT@sep}%
343   \multispan\LT@cols
344     \unskip\leaders\hrule\@height\arrayrulewidth\hfill\cr
345   \noalign{\penalty\@M}%
346   \@gtempa}
```

9.10 Captions

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

```
347 \def\LT@caption{%
348   \noalign\bgroup
349   \@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.

```
350 \def\LT@caption#1[#2]#3{%
351   \LT@makecaption#1\fnum@table{#3}%
352   \def\@tempa{#2}%
353   \ifx\@tempa\@empty\else
354     {\let\\space
355     \addcontentsline{\ext@table}{table}{\protect\numberline{\thetable}{#2}}}%
356   \fi}
```

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

```
357 \def\LT@caption{%
358   \@ifstar
```

⁶`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.

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```
359 {\egroup\LT@caption\@gobble[]}%
360 {\egroup\@xdblarg{\LT@caption\@firstofone}}}
```

`\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`.

```
361 \def\LT@makecaption#1#2#3{%
362 \LT@col\LT@cols c{\hbox to\z@{\hss\parbox[t]\LTcapwidth{%
```

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

```
363 \reset@font
364 \sbox\@tempboxa{#1{#2: }#3}%
365 \ifdim\wd\@tempboxa>\hsize
366 #1{#2: }#3%
367 \else
368 \hbox to\hsize{\hfil\box\@tempboxa\hfil}%
369 \fi
370 \endgraf\vskip\baselineskip}%
371 \hss}}}
```

9.11 The Output Routine

The method used here for interfacing a special purpose output routine to the standard L^AT_EX routine is lifted straight out of F. Mittelbach's `multicol` package.

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

```
372 \def\LT@output{%
373 \ifnum\outputpenalty <-\@Mi
374 \ifnum\outputpenalty > -\LT@end@pen
If this was a float or a marginpar we complain.
375 \LT@err{floats and marginpars not allowed in a longtable}\@ehc
376 \else
```

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

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

The last foot might not fit, so:⁷

```
379 \dimen@\pagegoal
380 \advance\dimen@\ht\LT@foot
381 \advance\dimen@-\ht\LT@lastfoot
382 \ifdim\dimen@<\ht\z@
383 \setbox\@cclv\vbox{\unvbox\z@\copy\LT@foot\vss}%
384 \@makecol
385 \@outputpage
386 \global\vsiz@\colroom
387 \setbox\z@\vbox{\box\LT@head}%
```

End of `\ifdim\dimen@<\ht\@cclc`.

```
388 \fi
```

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

```
389 \fi
```

⁷An 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.

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```

Reset \@colroom.
390 %      \global\@colroom\@colht
391 %      \global\ysize\@colht
Put the last page of the table on to the main vertical list.
392      \unvbox\z\box\ifvoid\LT@lastfoot\LT@foot\else\LT@lastfoot\fi
End of \ifnum\outputpenalty > -\LT@end@pen.
393      \fi
Else \outputpenalty > -\@Mi.
394      \else
If we have not reached the end of the table,
395      \setbox\@cc1v\vbox{\unvbox\@cc1v\copy\LT@foot\vss}%
396      \makecol
397      \@outputpage
Reset \ysize.
398      \global\ysize\@colroom
Put the head at the top of the next page.
399      \copy\LT@head\nobreak
End of \ifnum\outputpenalty <-\@Mi.
400      \fi}

```

9.12 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.

```

401 \def\LT@end@hd@ft#1{%
402   \LT@echunk
Changed from \relax to \endgraf at V3.04, see \LT@start.
403   \ifx\LT@start\endgraf
404     \LT@err
405     {Longtable head or foot not at start of table}%
406     {Increase LTchunksiz}%
407   \fi
408   \setbox#1\box\z@
409   \LT@get@widths
410   \LT@bchunk}

```

```

\endfirsthead Call \LT@end@hd@ft with the appropriate box.
\endhead 411 \def\endfirsthead{\LT@end@hd@ft\LT@firsthead}
\endfoot 412 \def\endhead{\LT@end@hd@ft\LT@head}
\endlastfoot 413 \def\endfoot{\LT@end@hd@ft\LT@foot}
414 \def\endlastfoot{\LT@end@hd@ft\LT@lastfoot}

```

9.13 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.

```

\LTmulticolumn
\LT@mcwarn

```

9.14 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`.

```

415 \def\LT@startpbox#1{%
416   \bgroup
417     \color@begingroup
418     \let\@footnotetext\LT@p@ftntext
419     \setlength\hsize{#1}%
420     \@arrayparboxrestore
421     \vrule \@height \ht\@arstrutbox \@width \z@}

```

`\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.

```

422 \def\LT@endpbox{%
423   \@finalstrut\@arstrutbox
424   \color@endgroup
425   \egroup
426   \the\LT@p@ftn
427   \global\LT@p@ftn{}%
428   \hfil}

```

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

```

429 \long\def\LT@p@ftntext#1{%
430   \edef\@tempa{\the\LT@p@ftn\noexpand\footnotetext[\the\c@footnote]}%
431   \global\LT@p@ftn\expandafter{\@tempa{#1}}}%
432 </package>

```