This is a list of all corrections made to *The TeXbook* between the first and second printings. If your copy says ‘Second printing (October 1984)’ on the copyright page, you’ve already got all of these things corrected. Otherwise, you’re a lucky owner of the rare first edition; read on.

Page 29, lines 31–32 (8/25/84)

> The underfull box that TeX produces in the 1.5-inch case is really bad; with such narrow limits, an occasional wide space is unavoidable. But try

Page 54, lines 5–6 (4/20/84)

> Appendix B shows that plain TeX handles most of the accents by using TeX’s \texttt{accent} primitive. For example, \texttt{\#1} is equivalent to \texttt{\textbackslash accent19 \#1}, where

Page 63, seven lines below the first illustration (2/27/84)

> points, a width of 5.5555 points, and a depth of zero; the letter ‘g’ has a height

Page 72, line 35 (2/28/84)

> from \texttt{0pt}, but \texttt{0.00001fill11} is infinitely greater than \texttt{16383.99999fill}.

Page 79, line 12 (2/28/84)

> \texttt{\hbox(6.25+1.94444)x312.0, glue set 0.5783, shifted 36.0 []}

Page 98, line 24 (4/13/84)

> and \texttt{finalhyphenmerits=5000}. Demerits are in units of “badness squared,” so the

Page 101, lines 29–30 (3/13/84)

> It’s possible to control the length of lines in a much more general way, if simple changes to \texttt{\leftskip} and \texttt{\rightskip} aren’t flexible enough for your

Page 113, bottom two lines (3/13/84)

> Notice that the first “% line” of our example says \texttt{t=10.0}; this is a consequence of another parameter, called \texttt{\topskip}. Glue disappears at a page break, but

Page 124, eighth-last line (8/25/84)

> discarded, \texttt{\box100} will be void after the \texttt{\vsplit}. And if \texttt{\box100} was void before the

Page 131, display in exercise 16.8 (3/16/84)

> If$ x = y $, then $ x $ is equal to $ y $.
Page 170, table in middle of the page

<table>
<thead>
<tr>
<th>Right atom</th>
<th>Ord</th>
<th>Op</th>
<th>Bin</th>
<th>Rel</th>
<th>Open</th>
<th>Close</th>
<th>Punct</th>
<th>Inner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ord</td>
<td>0</td>
<td>1</td>
<td>(2)</td>
<td>(3)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(1)</td>
</tr>
<tr>
<td>Op</td>
<td>1</td>
<td>1</td>
<td>*</td>
<td>(3)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(1)</td>
</tr>
<tr>
<td>Bin</td>
<td>(2)</td>
<td>(2)</td>
<td>*</td>
<td>*</td>
<td>(2)</td>
<td>*</td>
<td>*</td>
<td>(2)</td>
</tr>
<tr>
<td>Rel</td>
<td>(3)</td>
<td>(3)</td>
<td>*</td>
<td>0</td>
<td>(3)</td>
<td>0</td>
<td>0</td>
<td>(3)</td>
</tr>
<tr>
<td>Open</td>
<td>0</td>
<td>0</td>
<td>*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Close</td>
<td>0</td>
<td>1</td>
<td>(2)</td>
<td>(3)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(1)</td>
</tr>
<tr>
<td>Punct</td>
<td>(1)</td>
<td>(1)</td>
<td>*</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
<td>(1)</td>
</tr>
<tr>
<td>Inner</td>
<td>(1)</td>
<td>1</td>
<td>(2)</td>
<td>(3)</td>
<td>(1)</td>
<td>0</td>
<td>(1)</td>
<td>(1)</td>
</tr>
</tbody>
</table>

Page 173, line 11

Clearly $a_i < b_i$ for $i=1, 2, \ldots, n$.

Page 176, bottom two lines

\begin{itemize}
\item \textbf{EXERCISE 18.24}
\item Type set the display
\begin{equation}
\begin{bmatrix}
a & b & c \\
d & e & f \\
u & x \\
v & y \\
w & z \\
\end{bmatrix},
\end{equation}
using \texttt{lgroup} and \texttt{rgroup}.
\end{itemize}

Page 189, line 18

when there is an overlap.] If $e = 0$ and if there is an \texttt{leqno}, the equation number is

Page 204, line 31

of \texttt{a} is delimited by a left brace.

Page 212, line 23

it equals 2.) Similarly, \texttt{tracingmacros=2} will trace \texttt{output}, \texttt{everypar}, etc.

Page 216, first five lines

\begin{itemize}
\item Expanded definitions that are made with \texttt{edef} or \texttt{xdef} continue to expand
tokens until only unexpandable tokens remain, except that token lists produced by `\the' are not expanded further. Furthermore a token following `\noexpand' will not be expanded, since its ability to expand has been nullified. These two operations can be used to control what gets expanded and what doesn't.
\end{itemize}

Page 219, simplification of line 18

\begin{verbatim}
\advance\count0 by\count2 \hexdigit}
\end{verbatim}
Chapters 24 to 26 present summaries of all \TeX's operations in all modes, and when those summaries mention a \lq{(box)}\rq; they mean one of the seven

a relation, the solution is to insert \lq{}\rq; at the beginning of the right-hand formula; \TeX

of a box that spans columns \textit{i} through \textit{j}, hence the glue in such a box might shrink.

You have to be careful with the use of \texttt{&} and \texttt{\span} and \texttt{\cr}, because these tokens are intercepted by \TeX's scanner even when it is not expanding macros.

line (see Chapter 9). If you don't want a \texttt{\cr} at the end of a certain line, just type \texttt{\%} and the corresponding \texttt{\cr} will be \lq;commented out\rq; (This special mode doesn't work with \texttt{\+} lines, since \texttt{\+} is a macro whose argument is delimited by the token \lq;\cr\rq;, not simply by a token that has the same meaning as \texttt{\cr}. But you can redefine \texttt{\+} to overcome this hurdle, if you want to. For example, define a macro \texttt{\alternateplus} that is just like \texttt{\+} except that its argument is delimited by the active character \texttt{\^^M}; then include the command \texttt{\let\+=\alternateplus} as part of \texttt{\obeylines}.)

vertical list at what it thinks is the best place, and at such times it enters internal vertical mode and begins to read the commands in the current \texttt{\output} routine. When the output routine begins, \texttt{\box255} contains the page that \TeX has completed; the output routine is supposed to do something with this vbox. When the output routine ends, the list of items that it has constructed in internal vertical mode is placed just

\TeX's primitive command \texttt{\shipout{box}} is what actually causes output. It sends the contents of the box to the \texttt{dvi} file, which is \TeX's main output file; after \TeX has finished, the \texttt{dvi} file will contain a compact device-independent encoding of instructions that specify exactly what should be printed. When a box is shipped out, \TeX displays the values of \texttt{\count0} through \texttt{\count9} on your terminal, as explained in Chapter 15; these ten counters are also recorded in the \texttt{dvi} file, where they can be used to identify the page. All of the \texttt{\openout}, \texttt{\closeout}, and \texttt{\write} commands that appear inside of the \texttt{\langle box\rangle} are performed in their natural order as that box is being shipped out. Since a \texttt{\write} command expands macros, as explained in Chapter 21, \TeX's scanning mechanism might detect syntax errors while a \texttt{\shipout} is in progress. If \texttt{\tracingoutput} is nonzero at the time of a \texttt{\shipout}, the contents of the \texttt{\langle box\rangle} being shipped are written into your log file in symbolic form. You can say \texttt{\shipout} anywhere, not only in an output routine.
6) Finally, the \dosupereject macro is designed to clear out any insertions that have been held over, whether they are illustrations or footnotes or both:

\ifnum\insertpenalties>0
  \line{} \kern-\topskip \nobreak
  \vfill\supereject\fi

The mysterious negative \kern here cancels out the natural space of the \topskip glue that goes above the empty \line; that empty line box prevents the \vfill from disappearing into a page break. The vertical list that results from \dosupereject is placed on \TeX’s list of things to put out next, just after the straggling insertions have been reconsidered as explained in Chapter 15. Hence another super-eject will occur, and the process will continue until no insertions remain.

Page 262, line 14 (2/12/84)
\def\endindex{\mark{}\break\endgroup}

Page 262, lines 34 and 35 (2/12/84)
if \next is ‘\endindex’, the next commands executed will be ‘\vfill\mark{}\break\endgroup’; otherwise the line will be treated as a main entry.

Page 269, line 23 becomes two lines (8/25/84)
tokens like \(+12\); (3) keywords like \pt; (4) control sequence names like \dimen; or (5) the special symbols \{, \}, \$.

Page 274, line 24 (2/15/84)
\lineskip (interline glue if \baselineskip isn’t feasible)

Page 289, slight clarification on lines 39–41 (3/10/84)
A ⟨math character⟩ defines a 15-bit number either by specifying it directly with \mathchar or in a previous \mathchardef, or by specifying a 27-bit \delimiter value; in the latter case, the least significant 12 bits are discarded.

Page 307, a slightly more explicit answer (11/3/83)

6.3. It represents the heavy bar that shows up in your output. (This bar wouldn’t be present if \overfullrule had been set to \opt, nor is it present in an underfull box.)
Page 313, first four lines (3/13/84)

12.17. You get ‘A’ at the extreme left and ‘puzzle.’ at the extreme right, because the space between words has the only stretchability that is finite; the infinite stretchability cancels out. (In this case, \TeX’s rules about infinite glue differs from what you would get in the limit if the value of 1 fil were finite but getting larger and larger. The true

Page 315, first three lines (3/13/84)

14.14. Just say \parfillskip=\parindent. Of course, \TeX will not be able to find appropriate line breaks unless each paragraph is sufficiently long or sufficiently lucky; but with an appropriate text, your output will be immaculately symmetrical.

Page 324, line 16 (2/15/84)

18.41. $$\{\underbrace{\overbrace{\mathstrut a,\ldots,a}}_{\text{\ldots}}\}$$

Page 324, first line of answer 18.44 (4/11/84)

18.44. $$\mathop{{\sum}'}_{x\in A}f(x)\mathrel{\mathop=^\text{def}}$$

Page 333, beginning of the final paragraph (12/19/83)

Note: The stated preamble solves the problem and demonstrates that \TeX’s line-breaking capability can be used within tables. But this particular table is not really a good example of the use of \halign, because \TeX could typeset it directly, using \everypar in an appropriate manner to set up the hanging indentation, and using \par instead of \cr. For example, one could say

Page 341, the bottom line was left out! (2/9/84)

Footline .................................................. Page 1009

Page 345, top three lines (1/26/84)

A mathcode is relevant only when the corresponding category code is 11 or 12; therefore many of these codes will rarely be looked at. For example, the math code for \^\^\^M specifies the character \oplus, but it’s hard to imagine a user who would want \^\^\^M

Page 345, line 31 (2/29/84)

\delcode`\<="26830A \delcode`\="26E30F \delcode`\>="26930B

Page 347, lines 1 and 2 (3/16/84)

\count18=3 % this counter allocates math families 4, 5, 6, ...
\count19=255 % this counter allocates insertions 254, 253, 252, ...

Page 350, line 9 from the bottom (3/16/84)

text, whose information does not have to be loaded again.
subdivision in a document; to use it, you say \texttt{\beginsection}\langle section title\rangle followed by a blank line (or \texttt{\par}). The macro first emits glue and penalties, designed to start a new page if the present page is nearly full; then it makes a \texttt{\bigskip} and puts the section

\begin{verbatim}
\outer\def\beginsection#1\par{
\vskip0pt plus.3\vsize\penalty-250
\vskip0pt plus-.3\vsize\bigskip\vskip\parskip
\message{#1}\leftline{\bf#1}\nobreak\smallskip
\noindent}
\end{verbatim}

Page 359, starting with line 2 (11/16/83)

\begin{verbatim}
\mathchardef\ldotp="602E\mathchardef\cdotp="6201\mathchardef\colon="603A
\def\vbox{
\baselineskip=4pt \lineskiplimit=0pt
\kern6pt \hbox{.}\hbox{.}\hbox{.}}
\def\upbracefill{
\vtop{\ialign{##\crcr
\noalign{\kern3pt}
\upbracefill\crcr
\noalign{\kern3pt}}}}
\end{verbatim}

Page 359, seventh line from the bottom (2/29/84)

\begin{verbatim}
\def\overbrace#1{\mathop{\vbox{\ialign{##\crcr
\noalign{\kern3pt}
\downbracefill\crcr
\noalign{\kern3pt}}}}\limits}
\def\underbrace#1{\mathop{\vtop{\ialign{##\crcr
\noalign{\kern3pt}
\upbracefill\crcr
\noalign{\kern3pt}}}}\limits}
\end{verbatim}

Page 359, seventh line from the bottom (2/29/84)

\begin{verbatim}
\def\backslash{\delimiter"026E30F } \def\bracevert{\delimiter"000033E }
\end{verbatim}

Page 361, line 3 (8/17/84)

\begin{verbatim}
\def\buildrel#1\over#2{\mathrel{\mathop{\null#2}\limits^{#1}}}
\end{verbatim}
Page 363, line 10  
\ifhmode\edef@sf{\spacefactor=\the\spacefactor}/\fi

Page 364, starting with line 10  
\def\dosupereject{\ifnum\insertpenalties>0% something is being held over
\line{}\kern-\topskip\nobreak\vfill\supereject\fi}

Page 364, line 28  
\tracingmacros=2 \tracingparagraphs=1 \tracingrestores=1

Page 370, line 7  
information about the \TeX Users Group.)

Page 374, line 23  
log file when \tracingmacros=2 and \tracingcommands=2. One of the important ways

Page 379, line 1  
A particular item can be selected by its position number from the left:

Page 381, line 6  
\newcount\lineno \% the number of file lines listed

Page 381, lines 24 and 25  
Instead of listing a file verbatim, you might want to define a \verbatim macro such that \verbatim{$this$ is \{it!\}} yields \verb+'$this$ is \{it!\}'. It's somewhat

Page 385, lines 22 and 23  
macro, a parameter, or a token list variable; (b) when \TeX must determine whether
the token & or \span or \cr or \crcr is the end of an entry within an alignment.

Page 387, two paragraphs in right column

A. Exactamente. Pero los profesores son tan conservadores que temerían espantar al tipo de estudiante ⟨apisonadora⟩ que hace lo que le proponen para casa, obedientemente y de forma mecánica. Además, no creo que les gustase el trabajo adicional de calificar respuestas a preguntas abiertas. La forma tradicional es dejar la parte creativa para los cursos altos. Durante diecisiete años o más se enseña al estudiante a aprobar, luego de golpe, cerca de la graduación, se le pide que haga algo original.
Notice that the macros need to do their own checking for ligatures, and they also take appropriate actions when a paragraph begins with an opening quote. Since \kern

Inside the output routine, \box\footins will now be a vbox of hboxes, and

\hbox(7.6359+0.0)x269.62617 []

\beginlinemode and \beginparmode are defined to initiate these modes; and another

P. O. Box 1009, Haga Alto, CA 94321 USA}
[Also change the ZIP code in the return address on the envelope illustrated at the bottom of page 405.]

\font\twelveit=cmti10 at 12pt % (a cheap substitute for cmti12)

\parskip of 0pt plus .8pt between adjacent entries, and since there is room for more than 50 lines per column; therefore the manmac balancing routine tries to make both the top and bottom baselines agree at the end of the index. In applications where the glue is not so flexible it would be more appropriate to let the right-hand column be a little short; the best way to do this is probably to replace the command ‘\unvbox3’ by ‘\dimen2=\dp3 \unvbox3 \kern-\dimen2 \vfil’.

(The last two lines use \d@nger and \dd@nger, which are non-\outer equivalents of \danger and \ddanger; such duplication is necessary because control sequences of type \outer cannot appear within a \def.)

[The special fonts called cmi10 and cmi7 and cmi5 should really be called cmmi10 and cmmi7 and cmmi5.]
Page 433, last eight lines (8/17/84)
explained in Appendix G. If you want to increase the number of parameters past the number that actually appear in a font’s metric information file, you can assign new values immediately after that font has been loaded. For example, if some font \texttt{ff} with seven parameters has just entered \TeX’s memory, the command \texttt{\fontdimen13\ff=5pt} will set parameter number 13 to 5 pt; the intervening parameters, numbers 8–12, will be set to zero. You can even give more than seven parameters to \texttt{\nullfont}, provided that you assign the values before any actual fonts have been loaded.

Page 445, line 6 (11/11/83)
if \((a - \frac{1}{2}\theta) - (h(z) - v) < \varphi\), increase \(v\) by the difference. Finally construct a vbox of

Page 449, line 12 (1/18/84)
immediately clear why the ‘n’ should be attached to the ‘e’ in one case but not

Page 459, left column, line 2 (1/18/84)
\textit{al-Khwārizmī, abu Ja'far Muḥammad}

Page 460, index entry for Beethoven (8/16/84)
Change ‘von’ to ‘van’.

Page 461, third line in left column (8/25/84)
The entry for \texttt{\box255} should not be indented.

Page 461, index entry for boxed material (8/2/84)
Add ‘420’.

Page 462, index entry for \texttt{\colon} (11/16/83)
Add page 359 to this list.

Page 462, right column, third-last line (5/21/84)
[Change ‘crochets’ to ‘crotchets’; then move this entry down two lines.]

Page 463, right column, line 16 (5/20/84)
design size, 16–17, 213.

Page 464, index entry for \texttt{\dump} (1/10/84)
Add page 344 to this list.
<table>
<thead>
<tr>
<th>Page</th>
<th>Issue Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>464, right column, line 5</td>
<td>Dvořák, Antonín Leopold, 409.</td>
<td>1/5/84</td>
</tr>
<tr>
<td>464, index entry for \end</td>
<td>Page number 264 should be underlined.</td>
<td>8/25/84</td>
</tr>
<tr>
<td>465, index entry for \everydisplay</td>
<td>Add page 326 to this list.</td>
<td>8/25/84</td>
</tr>
<tr>
<td>465, index entry for \filbreak</td>
<td>Delete the reference to page number 355.</td>
<td>7/3/84</td>
</tr>
<tr>
<td>466, index entry for \footnote</td>
<td>Page number 363 should be underlined.</td>
<td>4/26/84</td>
</tr>
<tr>
<td>467, index entry for \hidewidth</td>
<td>Page number 354 should be underlined.</td>
<td>7/3/84</td>
</tr>
<tr>
<td>468, index entry for insertions</td>
<td>Add pages 115–117, 122–125 to this list.</td>
<td>8/25/84</td>
</tr>
<tr>
<td>469, index entry for \kern</td>
<td>Add page 256 to this list.</td>
<td>11/1/83</td>
</tr>
<tr>
<td>470, index entry for \limits</td>
<td>Add page 359 to this list.</td>
<td>11/3/83</td>
</tr>
<tr>
<td>472, right column, lines 10–11</td>
<td>\normalbaselines, 325, 349, 351, 414–415. \normalbaselineskip, 349, 414–415.</td>
<td>7/9/84</td>
</tr>
<tr>
<td>472, index entry for \null</td>
<td>Page number 351 should be underlined.</td>
<td>7/3/84</td>
</tr>
<tr>
<td>472, right column, line 28</td>
<td>\nullfont, 14, 153, 271, 433.</td>
<td>1/3/84</td>
</tr>
<tr>
<td>476, a new index entry</td>
<td>shifted output, see \hoffset, \voffset.</td>
<td>8/25/84</td>
</tr>
</tbody>
</table>
Page 476, index entry for shriek (8/25/84)

It should not be capitalized.

Page 478, index entry for Świerczkowski (9/15/84)

The middle name should be ‘Sławomir’.

Page 479, last seven lines in the left column (8/23/84)

*\tracingmacros, 205, 212, 273, 329.
*\tracingonline, 121, 212, 273, 303.
*\tracingoutput, 254, 273, 301–302.
*\tracingpages, 112–114, 124, 273, 303.
*\tracingparagraphs, 98–99, 273, 303.
*\tracingrestores, 273, 301, 303.
*\tracingstats, 273, 300, 303, 383.

Page 479, index entry for underlined text (8/2/84)

Add ‘see also \underbar’.

Page 480, index entry for \vbox (11/1/83)

Delete page 256 from this list.
This is a list of all corrections made to *The TeXbook* since the second printing. If your copy doesn’t say ‘Second printing (October 1984)’ on the copyright page, you should also look at the previous bug list. In fact, the most important corrections to the first printing were discovered first, so they’ve already been made.

**Page 23, line 16**  
(10/13/84)  
This is TeX, Version 1.0 (preloaded format=plain 83.7.15)

**Page 33, line 32**  
(10/21/84)  
The bottom line shows how far TeX has gotten until now in the story

**Page 41, lines 7 and 8**  
(10/8/85)  
\[ \text{The twin operations } \textit{\textbackslash uppercase\{token list\}} \text{ and } \textit{\textbackslash lowercase\{token list\}} \text{ go through a given token list and convert all of the character tokens to their} \]

**Page 57, line 17**  
(1/6/86)  
\[ \text{dd didot point (1157 dd = 1238 pt)} \]

**Page 61, lines 17–19**  
(12/18/85)  
\[ \text{depth, em, ex, fil, height, in, l, minus, mm, mu, pc, plus, pt, scaled, sp, spread, to, true, width. (See Appendix I for references to the contexts in which each of these is recognized as a keyword.)} \]

**Page 67, append a new exercise**  
(1/19/85)  
\[ \text{EXERCISE 11.6} \]

\[ \text{Construct a } \textit{\textbackslash frac} \text{ macro such that ‘} \textit{\textbackslash frac1/2} \text{’ yields ‘} \textit{1/2}. \]

**Page 130, line 15**  
(4/17/85)  
\[ \text{\$y^{'''}_3+g'^2\$} \]

**Page 170, line 5**  
(5/28/85)  
\[ \text{tall, unslanted letter; and so on. But two of the examples involve corrections that were} \]

**Page 194, lines 13–15 should be centered better**  
(10/22/84)

\[ \begin{align*}  
x & \equiv x; & \text{(1)} 
\text{if } x \equiv y \text{ then } y \equiv x; \quad & \text{(2)} 
\text{if } x \equiv y \text{ and } y \equiv z \text{ then } x \equiv z. \quad & \text{(3)} 
\end{align*} \]
general format is the same as for \def and \gdef, but \TeX blindy expands the tokens of the replacement text according to the expansion rules above. For example, consider

\begin{verbatim}
Weight  Servings  Approximate Cooking Time*
8 lbs.  6       1 hour and 50 to 55 minutes
9 lbs.  7 to 8  About 2 hours
9 1/2 lbs.  8 to 9  2 hours and 10 to 15 minutes
10 1/2 lbs.  9 to 10  2 hours and 15 to 20 minutes
\end{verbatim}

[Squab, Poussin, 2, \frac{3}{4} to 1, Broil, Grill, Roast]

[Broiler, Poulet Nouveau, 2 to 3, 1\frac{1}{2} to 2\frac{1}{2}, Broil, Grill, Roast]

[Fryer, Poulet Reine, 3 to 5, 2 to 3, Fry, Sauté, Roast]

[Roaster, Poularde, 5\frac{1}{2} to 9, Over 3, Roast, Poach, Fricassee]

[This change should also be made at the bottom of page 237.]

\begin{verbatim}
Squab&Poussin&2&\frac{3}{4} to 1&Broil, Grill, Roast\cr
\end{verbatim}

Page 236, fifth-last line (1/19/85)

\begin{verbatim}
Squab&Poussin&2&\frac{3}{4} to 1&Broil, Grill, Roast\cr
\end{verbatim}

Page 265, bottom line (11/6/85)

[insert a comma after ‘LEONTIEF’.]

Page 271, line 8 (11/12/85)

\begin{verbatim}
\langle\text{fil unit}\rangle \rightarrow \text{fil} \mid \langle\text{fil unit}\rangle 1
\end{verbatim}

Page 280, lines 7 and 8 (1/8/85)

\begin{verbatim}
\langle\text{4-bit number}\rangle. \text{The specified output stream is opened or closed, for use in \texttt{write}}
\end{verbatim}

\begin{verbatim}
\texttt{commands, as explained in Chapter 21.}
\end{verbatim}
what part of \TeX’s memory has become overloaded; one of the following fourteen things will be mentioned:

- number of strings (names of control sequences and files)
- pool size (the characters in such names)
- main memory size (boxes, glue, breakpoints, token lists, characters, etc.)

If you have a job that doesn’t overflow \TeX’s capacity, yet you want to see just how closely you have approached the limits, just set `\tracingstats` to a positive value before the end of your job. The log file will then conclude with a report on your actual usage of the first eleven things named above (i.e., the number of strings, . . . , the save size), in that order. Furthermore, if you set `\tracingstats` equal to 2 or more, \TeX will show its current memory usage whenever it does a `\shipout` command. Such statistics are broken into two parts; ‘490&5950’ means, for example, that 490 words are being used for “large” things like boxes, glue, and breakpoints, while 5950 words are being used for “small” things like tokens and characters.

.\tenrm | (ligature ---)

sentable as ‘\^M. Asking \TeX to `\show\^M produces the response ‘> `\^M=macro:->\^\. ‘.

no “explicit kerns,” and an italic correction is an explicit kern.) But the italic correction may be too much (especially in an italic font); `shelf{\kern0pt}ful` is often best.

\def\appendroman#1#2#3{\edef#1{\def\noexpand#1{\csname

[This causes answer 12.8 to move to page 312; answer 12.16 also moves to page 313.]

\def\frac#1/#2{\leavevmode\kern.1em
\raise.5ex\hbox{\the\scriptfont0 #1}\kern-.1em
/\kern-.15em\lower.25ex\hbox{\the\scriptfont0 #2}}

[This causes answer 12.8 to move to page 312; answer 12.16 also moves to page 313.]

\def\sqr#1#2{{\vcenter{\vbox{\hrule height.2pt
\hbox{\vrule width.2pt height#1pt \kern#1pt
\vrule width.2pt}}}}

[This causes answer 12.8 to move to page 312; answer 12.16 also moves to page 313.]

\def\sqr#1#2{{\vcenter{\vbox{\hrule height.2pt
\hbox{\vrule width.2pt height#1pt \kern#1pt
\vrule width.2pt}}}}}
Page 327, lines 26–33 (10/22/84)

19.16. $$\displaylines{\hfill x\equiv x;\hfill(1)\cr \hfill\hbox{if}\quad x\equiv y\quad\hbox{then}\quad y\equiv x;\hfill(2)\cr \hfill\hbox{if}\quad x\equiv y\quad\hbox{and}\quad y\equiv z\quad\hbox{then}\quad x\equiv z.\hfill(3)\cr}$$

There’s also a trickier solution, which begins with

$$\displaylines{x\equiv x;\hfil(1)\hfilneg\cr$$

Page 330, line 29 (11/15/85)

\edef\next#1#2{\def#1{\b#2\d}} \next\a\c

Page 332, lines 17–24 (1/19/85)

\settabs\+\\indent&10\frac1/2 lbs.\qquad&\it Servings&\quad&\cr
\+&\negthinspace\it Weight&\it Servings&
\smallskip
\+&8 lbs.\quad&6 to 8\quad&About 2 hours\cr
\+&9 lbs.\quad&7 to 9\quad&10 to 15 minutes\cr
\+&10\frac1/2 lbs.\quad&9 to 10\quad&15 to 20 minutes

Page 332, lines 33–35 (1/19/85)

proofs. (You weren’t supposed to think of this, but it has to be mentioned.) See exercise 11.6 for the ‘\frac’ macro; it’s better to say ‘$\frac{1}{2}$’ than ‘$\frac{1}{2}$’, in a cookbook.

Another way to treat this table would be to display it in a vbox, instead of including a first column whose sole purpose is to specify indentation.

Page 337, line 28 (11/12/85)

\nextnumber. Quick should put ‘\relax’ at the end of his macro. (The keywords 1,
Page 358, lines 8–12 (1/23/85)
\def\hbar{{\mathchar'26\mkern-9muh}}
\def\surd{{\mathchar"1270}}
\def\angle{{\vbox{\ialign{$\m@th\scriptstyle##$}
\not\mathrel{\mkern14mu}\crcr
\noalign{\nointerlineskip}\mkern2.5mu\leaders\hrule height.34pt\hfill\mkern2.5mu\crcr}}}

Page 359, lines 7–8 (1/22/85)
\def\ddots{\mathinner{\mkern1mu\raise7pt\vbox{\kern7pt\hbox{.}}\mkern2mu\raise4pt\hbox{.}\mkern2mu\raise1pt\hbox{.}\mkern1mu}}

Page 360, line 22 (1/22/85)
\mkern5mu \raise.6\dimen@\copy\rootbox \mkern-10mu \box0}

Page 361, line 3 (3/27/85)
\def\buildrel#1\over#2{\mathrel{\mathop{\kern0pt #2}\limits^{#1}}}

Page 361, lines 19–20 (1/22/85)
\def\bmod{\mskip-\medmuskip \mkern5mu\mathbin{\rm mod} \penalty900 \mkern5mu\mskip-\medmuskip}

Page 361, line 27 (5/1/85)
\def\matrix#1{\null\,\vcenter{\normalbaselines\m@th
null\;}\vbox{\kern\ht1\box2}\endgroup}

Page 362, line 9 (5/1/85)
\def\eqalign#1{\null\,\vcenter{\openup1\jot \m@th
\null\;}\vbox{\kern\ht1\box2}\endgroup}

Page 362, lines 17–29 (8/10/85)
\def\@lign{\tabskip=\displaystyle#1}} % restore inside \display@y
\def\displaylines#1{\display@y
\halign{\hbox to\displaywidth{$\hfil@lign\displaystyle##\hfil$}\crcr
#1\crcr}}
\def\eqalignno#1{\display@y \tabskip=\centering
\halign to\displaywidth{$\hfil@lign\displaystyle##$}$\tabskip=0pt
&@$\@lign\displaystyle{}##$}$\hfil}\tabskip=\centering
&\llap{$\@lign##$}$\tabskip=0pt\crcr
#1\crcr}}
\def\leqalignno#1{\display@y \tabskip=\centering
\halign to\displaywidth{$\hfil@lign\displaystyle##$}$\tabskip=0pt
&@$\@lign\displaystyle{}##$}$\hfil}\tabskip=\centering
&kern-\displaywidth rlap{$\@lign##$}$\tabskip=\displaywidth\crcr
#1\crcr}}
Page 363, line 9 \(5/12/85\)
\[\def\footnote#1{\let\@sf=\empty % parameter #2 (the text) is read later\]

Page 364, line 3 \(3/23/85\)
\[\def\plainoutput{\shipout\vbox{\makeheadline\pagebody\makefootline}}%\]

Page 364, fifth-last line \(9/15/85\)
\[\def\fmtname{plain}\def\fmtversion{2.0} % identifies the current format\]

Page 399, eighth-last line \(2/11/85\)
\[\baselineskip=\footnotebaselineskip\noindent\unhbox0\par}\]

Page 401, line 5 \(1/29/85\)
\[\text{\fontdimen parameters to qualify as a math symbol font). (2) Set all the font identifiers}\]

Page 414, line 10 \(12/17/84\)
\[\text{\font\titlefont=cmssdc40 \% titles in chapter openings}\]

Page 444, bottom line \(1/10/85\)
\[\text{depth \(d(z) + v\), consisting of box \(x\) followed by an appropriate kern followed by box \(z\).}\]

Page 461, entry for character codes \(11/6/85\)
Add ‘see also category codes’.

Page 463, entries for dd, Didot, and didot \(1/6/86\)
Remove the circumflex accents.

Page 466, left column \(1/19/85\)
huge, 196.
slashed form, 67, 139–140, 233, 236.

Page 467, index entry for \hsize \(6/14/85\)
Add a reference to page 60.

Page 469, index entry for \kern \(7/1/85\)
Add a reference to page 306.

Page 469, index entry for kerns \(7/1/85\)
Add a reference to page 306.
Page 469, new entry (11/12/85)
l after fil, 271, 337.

Page 469, second line on the right (9/13/85)
\LaTeX, 137.

Page 470, index entries for \textbackslash longleftarrow thru \textbackslash Longrightarrow (10/5/84)
The references to page 358 should be underlined (seven times).

Page 475, index entry for punctuation in formulas (4/29/85)
Add a reference to page 161.

Page 476, index entry for \textbackslash scriptspace (8/10/85)
Change ‘445’ to ‘445–446’.

Page 478, first and last lines (10/11/84)
Delete the last line in the right-hand column (since it appears on page 479), and add the following line at the top of the left-hand column (since it was dropped by mistake from the second printing):

Page 478, new entry after tabbing (5/28/85)
tables, see alignments, tabbing.

Page 478, tabskip entries (3/25/85)

Page 481, the entry for \textbackslash widetilde (9/23/85)
Page 359 should be underlined.

Page 483, lines 16–17 (1/19/85)
P.O. Box 9506
Providence RI 02940–9506, USA.

Page 483, lines 22–23 (1/19/85)
P.O. Box 9506
Providence RI 02940–9506, USA.

Note: The next printing will use the “real” Computer Modern fonts instead of the “almost” Computer Modern fonts. Therefore many of the line breaks will be slightly different. Also, the font-related numerical data on pages 27, 29, 66, 75, 76, 79, 88, 98, 99, 112, 113, 310, 314, 396, 399, 409, 420, and 459 will be different. However, these differences need not be listed here, because the old book was correct with respect to the old fonts.
This is a list of all corrections made to *Computers & Typesetting*, Volumes A–E, between the date of publication (May, 1986) and 15 June 1987. It also includes corrections made to the softcover version of *The \TeX*book, beginning with the sixth printing (January 1986); these are the same as corrections to Volume A. Corrections to the softcover version of *The METAFONT*book are the same as corrections to Volume C.

Page A7, fourth line from the bottom  
(6/28/86)  
since control sequences of the second kind always have exactly one symbol after

Page A35, second-last line  
(1/31/87)  
*He may run who reads.*  
— HABAKKUK 2:2 (c. 600 B.C.)  
*He that runs may read.*

Page A43, lines 8–9  
(8/23/86)  
of Appendix B, which defines \% to be a special kind of symbol so that you can use it for comments, defines the control sequence \% to mean a percent sign.

Page A45, lines 10–13  
(8/23/86)  
\TeX adds 64. Hence code 127 can be typed ^\?
, and the dangerous bend sign can be obtained by saying \texttt{\{\manual\{\}^\?
}. However, you must change the category code of character 127 before using it, since this character ordinarily has category 15 (invalid); say, e.g., \texttt{\catcode\'}^\?\?=12. The ^\? notation is different from \texttt{\char}, because ^\?

Page A76, line 7  
(8/23/86)  
and extra space; for example, these quantities are 3.33333 pt, 1.66666 pt, 1.11111 pt,

Page A83, bottom line  
(5/19/87)  
[This line should be flush right.]

Page A111, 7th-last line, right-hand column  
(2/15/87)  
if $b = 10000$ and $-10000 < p < 10000$ and $q < 10000$;

Page A117, second-last line  
(6/10/87)  
marks; sometimes also $\|\|$ (||). You can say, e.g., \texttt{\footnote{\dag}{...}}.
of insertion; an additional ‘\penalty-10000’ item is assumed to be present at the end of the vertical list, to ensure that a legal breakpoint exists.) Let \( u \) be the natural height plus depth of that least-cost box, and let \( r \) be the penalty associated with the optimum breakpoint. Decrease \( g \) by \( uf \), and increase \( q \) by \( r \). (If \( \text{tracingpages}=1 \), the log file should now get a cryptic message that says ‘\% split \( n \) to \( v \), \( u \ p=r \)’. For example,

\[
\% \text{ split254 to 180.2,175.3 p=100}
\]

the second atom, which has subscript \( i \); the superscripts are empty except for the last atom, whose superscript is \( n+1 \). This superscript is itself a math list consisting of one atom, whose nucleus is \( n+1 \); and that nucleus is a math list consisting of three atoms.

will be surrounded by more space than there would be if that subformula were enclosed

You can insert ‘\noalign{(vertical mode material)}’ just after any \( \text{cr} \) within

‘&’ or ‘\span’ or ‘\text{cr}’, it needs some way to decide which alignment is involved.

line (see Chapter 8). If you don’t want a \( \text{cr} \) at the end of a certain line, just type

| \text{font}(control sequence)(equals)(file name)(at clause) |
| (global assignment) |

[The bottom line of p. 276 will now move to the top of p. 277.]

\( \text{font assignment} \rightarrow \text{fontdimen}(number)(font)(equals)(dimen) \)

\( \text{sfcode} \) table as described in Chapter 12; characters numbered 128 to 255 set the

\( \text{\%} \). This “discretionary hyphen” command is defined in Appendix H.
Page A292, lines 9–10 (2/15/87)

- This command is usually equivalent to \texttt{discretionary\{-\}{\{-\}}}; the \texttt{-} is therefore interpreted as a hyphen, not as a minus sign. (See Appendix H.)

Page A308, lines 25–26 (6/1/87)
\def\appendroman#1#2#3{\edef#1{\csname \expandafter\gobble\string#2\romannumeral#3\endcsname}}

Page A312, lines 10–14 (8/23/86)

\textbf{12.11.} The interline glue will be zero, and the natural height is $1 + 1 - 3 + 2 = 1 \text{ pt}$ (because the depth of \texttt{box2} isn't included in the natural height); so the glue will ultimately become \texttt{vskip-1pt} when it's set. Thus, \texttt{box3} is 3 pt high, 2 pt deep, 4 pt wide. Its reference point coincides with that of \texttt{box2}; to get to the reference point of \texttt{box1} you go up 2 pt and right 3 pt.

Page A312, line 21 (8/23/86)
up 4 pt to get to the upper left corner of \texttt{box4}; then down $-1.6 \text{ pt}$, i.e., up 1.6 pt, to

Page A319, line 20 (31/3/87)
make ordinary periods act like \texttt{cdot} symbols: Just define \texttt{mathcode'}. to be "0201,

Page A328, lines 18–19 (5/14/87)
not performed while the expansion is taking place, and the control sequences following \texttt{def} are expanded; so the result is an infinite string

A\def A\def A\def A\def A\def A\def A\def A\def A... 


\textbf{20.5.} The \texttt{##} feature is indispensable when the replacement text of a definition contains other definitions. For example, consider

Page A356, lines 6–7 (1/30/87)
\spaceskip=.3333em \xspaceskip=.5em\relax}
\def\ttraggedright{\tt\rightskip=0pt plus2em\relax}

Page A356, line 33 (6/1/87)
\vbox to.2ex{\hbox{\char'26}\vss}\hidewidth}

Page A357, tenth-last line (10/13/86)
\let\sp=" \let\sb=_ \{\catcode'\_={\active \global\let_=\_}
Page A357, third-last and second-last lines (2/17/87)
\def\pr@m@s\{\ifx'\next\let\nxt\pr@@@s \else\ifx^\next\let\nxt\pr@@@t \else\let\nxt\egroup\fi\fi \nxt\}

Page A364, fifth-last line (1/30/87)
\def\fmtname{plain}\def\fmtversion{2.3} % identifies the current format

Page A368, bottom line (2/26/86)
that includes the symbols ←, ↓, ≠, ≤, and ≥, and he finds that this makes it much more

Page A396, line 13 (8/23/86)
\hyphenpenalty=10000 \exhyphenpenalty=10000

Page A414, line 10 (3/4/86)
\font\titlefont=cmssdc10 at 40pt % titles in chapter openings

Page A427, line 7 (2/23/86)
the author’s book Computer Modern Typefaces.)

Page A428, lines 18–20 (6/15/87)
The first eight of these all have essentially the same layout; but cmr5 needs no
ligatures, and many of the symbols of cmti10 have different shapes. For example,
the ampersand becomes an ‘E.T.’, and the dollar changes to pound sterling:

Page A434, lines 25–28 (8/17/86)
from \nu (ν). Similarly, \varsigma (ς) should not be confused with \zeta (ζ). It
turns out that \varsigma and \upsilon are almost never used in math formulas;
they are included in plain \TeX primarily because they are sometimes needed in
short Greek citations (cf. Appendix J).

Page A447, line 32 (6/1/87)
ters also affect mathematical typesetting: dimension parameters \delimitershortfall

Page A455, new paragraph to follow line 9 (2/15/87)
\Z\Z The control sequence \- is equivalent to \discretionary{\char h}{\char h}{},
\Z\Z where \h is the \hyphenchar of the current font, provided that \h lies be-
\Z\Z tween 0 and 255. Otherwise \- is equivalent to \discretionary{}{}{}.

Page A457, left column, fifth-last line (2/17/87)
155, 201, 305, 324, 357, 394–395;
<table>
<thead>
<tr>
<th>Page A458, left column, line 6</th>
<th>(2/15/87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>*- (discretionary hyphen), 95, 283, 287, 292, 455.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page A458, left column, near the bottom</th>
<th>(5/19/87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>! (exclamation point), 51, 72, 73, 75, 169.</td>
<td></td>
</tr>
<tr>
<td>[This saves a line that otherwise would make the index too long on page 481! ]</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page A458, right column, line 10</th>
<th>(11/27/86)</th>
</tr>
</thead>
<tbody>
<tr>
<td>~ (tilde), 38, 51, 343, 353; see also ties.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page A458, right column</th>
<th>(6/14/87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>\accent (general accent), 9, 54, 86, 283, 286.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page A461, entry for boxes</th>
<th>(3/16/87)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Page A461, entry for \centering</th>
<th>(1/28/86)</th>
</tr>
</thead>
<tbody>
<tr>
<td>\centering, 347, 348, 362.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page A462, entry for (code assignment)</th>
<th>(1/27/86)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(code assignment), 277.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page A464, left column, line 3</th>
<th>(2/15/87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>discretionary hyphens, 28, 95–96, 453, 455.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page A465, right column, line 8</th>
<th>(5/3/87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>expansion of expandable tokens, 212–216, 238,</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page A466, entry for \font, second line</th>
<th>(1/27/86)</th>
</tr>
</thead>
<tbody>
<tr>
<td>\font, 271, 276.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page A466, new entry</th>
<th>(2/3/87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>\fontdef token, 271.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page A467, entry for \hideskip</th>
<th>(1/28/86)</th>
</tr>
</thead>
<tbody>
<tr>
<td>\hideskip, 347, 348, 354.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Page A468, left column line 2</th>
<th>(2/15/87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>351, 395, 414, 454, 455.</td>
<td></td>
</tr>
</tbody>
</table>
Page A470, entry for \texttt{manfnt} (1/15/86)

\texttt{manfnt}, 44, 408, 414.

Page A471, entry for \texttt{\medbreak} (10/13/86)

\texttt{\medbreak}, 111, 113, 353, 355, 419, 422.

Page A471, entry for \texttt{\moveright} (2/27/87)

*\texttt{\moveright}, 80–81, 221, 282.

Page A471, entry for Mozart, second line (3/19/86)

Gottlieb (= Theophilus = Amadeus), 409.

Page A472, the entry for \texttt{\not} (2/12/87)

[The overprinting here is intentional, since \texttt{\not} is a character of width zero. More than a dozen people have reported this as an error, but it is not!]

Page A477, entry for \texttt{\span} (5/3/87)

*\texttt{\span}, 215, 238, 243, 244, 245, 248, 249, 282, 330, 385.

Page A479, entry for ties, second line (11/27/86)

173, 353, 404.

Page A480, changes to various entries (6/14/87)

*\texttt{\underline}, 130–131, 141, 291, 443.
*\texttt{\unhcopy}, 120, 283, 285, 353.
*\texttt{\unkern}, 280.
*\texttt{\unpenalty}, 280.
*\texttt{\unskip}, 222–223, 280, 286, 313, 392, 418–419.
*\texttt{\unvcopy}, 120, 282, 286, 361.
*\texttt{\vadjust}, 95, 105, 109, 110, 117, 259, 281, 393, 454.
*\texttt{\vfill}, 71, 72, 281, 286, 417.
*\texttt{\vfilneg}, 72, 111, 281, 286.
\texttt{\voidb@x}, 347, 348.

Page A481, left column (6/14/87)

*\texttt{\vss}, 71, 72, 255, 281, 286.
[A number of entries were mistakenly omitted from the mini-indexes on the right-hand pages. Here is a combined list of all the missing items; you can mount it inside the back cover, say, as a secondary mini-index when the first one fails... ]

active_base = 1, §222.
aux = macro, §213.
begin_name: procedure, §515.
big_switch = 60, §1030.
choice_node = 15, §689.
cur_boundary: 0 .. save_size, §271.
cur_c: quarterword, §724.
cur_group: group_code, §271.
cur_i: four_quarters, §724.
cur_level: quarterword, §271.
do_extension: procedure, §1348.
dw_buf: array, §595.
dw_gone: integer, §595.
dw_limit: dw_index, §595.
dw_offset: integer, §595.
dw_ptr: dw_index, §595.
endgraf: procedure, §1096.
error: procedure, §82.
error_stop_mode = 3, §73.
font_base = 0, §12.
font_info: array, §549.
get_token: procedure, §365.
glue_base = 2626, §222.
half_buf: dw_index, §595.
handle_right_brace: procedure, §1068.
hash_base = 258, §222.
head = macro, §213.
hyf_distance: array, §921.
hyf_next: array, §921.
hyf_num: array, §921.
index = macro, §302.
inf: boolean, §448.
init_col: procedure, §788.
init_span: procedure, §787.
input_in: function, §31.
interaction: 0 .. 3, §73.
limit = macro, §302.
line_width: scaled, §830.
macro_call: procedure, §389.
main_control: procedure, §1030.
mem: array, §116.
mem_bot = 0, §12.
mem_end: pointer, §118.
mem_top = macro, §12.
mlist_to_hist: procedure, §726.
mode = macro, §213.
mode_line = macro, §213.
more_name: function, §516.
mu: boolean, §448.
name = macro, §302.
nest: array, §213.
off_save: procedure, §1064.
open_log_file: procedure, §534.
output_active: boolean, §989.
p: pointer, §498.
param_stack: array, §308.
pool_file: alpha_file, §50.
pool_ptr: pool-pointer, §39.
prefixed_command: procedure, §1211.
prev_depth = macro, §213.
prev_graf = macro, §213.
prev_prev_r: pointer, §830.
print_err = macro, §73.
r: trie_pointer, §960.
reconstitute: function, §906.
resume_after_display: procedure, §1200.
save_ptr: 0 .. save_size, §271.
save_stack: array, §271.
scan_dimen: procedure, §448.
scan_math: procedure, §1151.
short_display: procedure, §174.
short_node_list: procedure, §182.
start = macro, §302.
state = macro, §302.
str_pool: packed array, §39.
str_ptr: str_number, §39.
str_start: array, §39.
tail = macro, §213.
trap_zero_glue: procedure, §1229.
trie: array, §921.
trie_char = macro, §921.
trie_ptr: macro, §921.
trie_op = macro, §921.
vlist_out: procedure, §629.
write_loc: pointer, §1345.

[The percent signs in all the comments (for example, on pages 7 and 50) are in the wrong font! Change ‘%’ to ‘%’.

Page Bvi, bottom line, and top line of next page

puter Science Report 1097 (Stanford, California, April 1986), 146 pp. The WEB programs for four utility programs that are often used with TeX: POOLtype, TFtoPL, PLtoTF, and DVIType.

Page B2, line 32

define banner ≡ 'This is TeX, Version 2.2' { printed when TeX starts }
Page B7, new line after line 25 (1/28/87)

if max_in_open ≥ 128 then bad ← 6;

Page B13, first three lines (4/7/87)

The ‘name’ parameter, which is of type ‘packed array [⟨any⟩] of char’, stands for the name of the external file that is being opened for input or output. Blank spaces that might appear in name are ignored.

Page B14, line 30 (4/7/87)

31. The input ln function brings the next line of input from the specified file into available

Page B18, line 30 (5/22/86)

str_ptr: str_number;  { number of the current string being created }

Page B21, first line of mini-index, right column (6/14/87)

pool_name = "string", §11.

Page B34, lines 5–6 (6/14/87)

to delete a token, and/or if some fatal error occurs while T eX is trying to fix a non-fatal one. But such recursion is never more than two levels deep.

Page B55, lines 12–13 (4/21/87)

if r = p then if rlink(p) ≠ p then ⟨Allocate entire node p and goto found 129⟩;

Page B57, lines 25–28 (6/14/87)

The first of these has font = font_base, and its link points to the second; the second identifies the font and the character dimensions. The saving feature about oriental characters is that most of them have the same box dimensions. The character field of the first char_node is a “charext” that distinguishes between graphic symbols whose dimensions are identical for typesetting purposes. (See the METAFONT manual.) Such an extension of T eX would not be difficult; further details are left to the reader.

Page B58, second line of section 136 (7/23/86)

the values corresponding to ‘\hbox{’}. The subtype field is set to min-quarterword, since that’s
location is more efficient than dynamic allocation when we can get away with it. For example, locations \texttt{mem\_bot} to \texttt{mem\_bot} + 3 are always used to store the specification for glue that is ‘0pt plus 0pt minus 0pt’. The following macro definitions accomplish the static allocation by giving symbolic names to the fixed positions. Static variable-size nodes appear in locations \texttt{mem\_bot} through \texttt{lo\_mem\_stat\_max}, and static single-word nodes appear in locations \texttt{hi\_mem\_stat\_min} through \texttt{mem\_top}, inclusive. It is harmless to let \texttt{lig\_trick} and \texttt{garbage} share the same location of \texttt{mem}.

\{ previous \texttt{mem\_end}, \texttt{lo\_mem\_max}, and \texttt{hi\_mem\_min} \}

\begin{verbatim}
begin while \texttt{p > mem\_min} do
[Now \texttt{null} can be removed from the mini-index.]
\end{verbatim}

\textbf{procedure} show\_node\_list(\texttt{p : integer}); \{ prints a node list symbolically \}

\begin{verbatim}
while \texttt{p > mem\_min} do
\end{verbatim}

\textbf{define} \texttt{relax} = 0 \{ do nothing ( \texttt{\relax} ) \}

that their special nature is easily discernible. The “expandable” commands come first.

\textbf{procedure} print\_mode(\texttt{m : integer}); \{ prints the mode represented by \texttt{m} \}

In the first region we have 128 equivalents for “active characters” that act as control sequences, followed by 128 equivalents for single-character control sequences.

This variable has six possible values:
begin if (end_line_char < 0) \lor (end_line_char > 127) then incr(limit);
if limit = start then \{ previous line was empty \}

389. After parameter scanning is complete, the parameters are moved to the param_stack. Then the macro body is fed to the scanner; in other words, macro_call places the defined text of the control sequence at the top of \TeX\’s input stack, so that get_next will proceed to read it next.

495. When we begin to process a new \if\, we set if_limit \leftarrow if_code; then if \or or \else or \fi

name and area strings nom and aire, and the “at” size s. If s is negative, it’s the negative of a scale factor to be applied to the design size; s = –1000 is the normal case. Otherwise s will be substituted for the design size; in this case, s must be positive and less than 2048 pt (i.e., it must be less than $2^{27}$ when considered as an integer).

done: if file_opened then b_close(tfm_file);
read_font_info \leftarrow g;

In the case of c_leaders (centered leaders), we want to increase cur_h by half of the excess space not occupied by the leaders; and in the case of x_leaders (expanded leaders) we increase

cur_s
: integer, §616. mag = macro, §236. pop = 142, §586.
which will be ignored in the calculations because it is a highly negative number.

the current string would be ‘.\_./’ if \( p \) points to the ord_noad for \( x \) in the (ridiculous) formula
\[
\sqrt{a^{b_{c\over x+y}}}.
\]

box \( b \) and changes it so that the new box is centered in a box of width \( w \). The centering is done by putting \{\hss\} glue at the left and right of the list inside \( b \), then packaging the new box; thus, the actual box might not really be centered, if it already contains infinite glue.

\textit{pass\_number}: halfword; \{ the number of passive nodes allocated on this pass \}

\textit{v}: pointer; \{ points to a glue specification or a node ahead of \( \text{cur\_p} \) \}
\textit{t}: integer; \{ node count, if \( \text{cur\_p} \) is a discretionary node \}

\begin{verbatim}
s ← \text{cur\_p};
if \text{break\_type} > \text{unhyphenated then if \text{cur\_p} \neq \text{null then}}
    \langle \text{Compute the discretionary break\_width values 840} \rangle;
    \textbf{while} s \neq \text{null do}
        \textbf{:} \quad \text{[as before, but indented one less notch]}
    \textbf{end;}
\end{verbatim}

will be the background plus \( l_1 \), so the length from \( \text{cur\_p} \) to \( \text{cur\_p} \) should be \( \gamma + l_0 + l_1 - l \), minus the length of nodes that will be discarded after the discretionary break.

\begin{verbatim}
begin t ← \text{replace\_count}(\text{cur\_p}); v ← \text{cur\_p}; s ← \text{post\_break}(\text{cur\_p});
while t > 0 do
    begin \textbf{decr}(t); v ← \text{link}(v); \langle \text{Subtract the width of node } v \text{ from break\_width 841} \rangle;
        \textbf{end;}
    while s \neq \text{null do}
        begin \langle \text{Add the width of node } s \text{ to break\_width and increase } t, \text{ unless it’s discardable 842} \rangle;
            \textbf{end;}
\end{verbatim}

if \( t = 0 \) then \( s ← \text{link}(v); \} \text{ more nodes may also be discardable after the break } \}
Page B354, lines 26–34  
[Change ‘s’ to ‘v’ throughout this section (8 times).]

Page B354, line 9 from the bottom  
842.  ⟨Add the width of node s to break_width and increase t, unless it's discardable 842⟩ \equiv

Page B355, lines 1–3  
\[\text{hlist_node, vlist_node, rule_node: } \text{break_width}[1] \leftarrow \text{break_width}[1] + \text{width}(s);\]
\[\text{kern_node: if } (t = 0) \land (\text{subtype}(s) \neq \text{acc_kern}) \text{ then } t \leftarrow -1 \\{\text{discardable}\}\]
\[\text{else break_width}[1] \leftarrow \text{break_width}[1] + \text{width}(s);\]
\[\text{othercases confusion("disc2")}\]
\[\text{endcases};\]
\[\text{incr}(t)\]

Page B355, patches to mini-index at bottom  
acc_kern = 2, §155.
incr = macro, §16.
t: integer, §830.
v: pointer, §830.

Page B372, lines 12–14  
⟨Change discretionary to compulsory and set disc_break \leftarrow true 882⟩
\[\text{else if } (\text{type}(q) = \text{math_node}) \lor (\text{type}(q) = \text{kern_node}) \text{ then } \text{width}(q) \leftarrow 0;\]

Page B380, fifth-last line  
b and c, the two patterns with and without hyphenation are a b - cd ef and a bc de f. Thus the

Page B386, lines 2–4  
hyphenation, TeX first looks to see if it is in the user’s exception dictionary. If not, hyphens are inserted based on patterns that appear within the given word, using an algorithm due to Frank M. Liang.

Page B397, line 28  
h = z – c. It follows that location trie_max will never be occupied in trie, and we will have

Page B415, the mini-index  
[Delete the spurious entry for ‘c’.]

Page B419, mini-index entry for c  
c: integer, §994.
Page B422, line 24 (8/23/86)

\[ \text{prev}_p : \text{pointer}; \{ \text{predecessor of } p \} \]

Page B435, line 16 (10/12/86)

\[
\begin{align*}
\text{width}(p) & \leftarrow \text{font}_\text{info}[k].\text{sc}; \{ \text{that's } \text{space}(f) \} \\
\text{stretch}(p) & \leftarrow \text{font}_\text{info}[k+1].\text{sc}; \{ \text{and } \text{space}_\text{stretch}(f) \} \\
\text{shrink}(p) & \leftarrow \text{font}_\text{info}[k+2].\text{sc}; \{ \text{and } \text{space}_\text{shrink}(f) \}
\end{align*}
\]
[And the mini-index gets three new entries: \text{space} = \text{macro}, §558. \text{space}_\text{shrink} = \text{macro}, §558. \text{space}_\text{stretch} = \text{macro}, §558.]

Page B495, lines 18 and 19 (2/15/87)

[delete these lines, since the cases cannot occur]

Page B510, line 8 (12/15/86)

\[ \text{"Pretend that you're Hercule Poirot: Examine all clues,"} \]

Page B527, new line to follow line 13 (6/17/86)

This program doesn’t bother to close the input files that may still be open.

Page B534, fourth-last line (5/4/87)

\[
\begin{align*}
\text{define } \text{write}_\text{stream}(\#) & \equiv \text{info}(\#+1) \{ \text{stream number (0 to 17)} \}
\end{align*}
\]

Page B544, left column (1/28/87)

\[ \text{ace}_\text{kern}: 155, 191, 837, 842, 879, 1125. \]

Page B546, entry for \textit{c} (4/6/87)

[Add a reference to section 994.]

Page B547, left column (4/7/87)

\[ \text{char: } 19, 26–27, 520, 534. \]

Page B547, left column (6/14/87)

Chinese characters: 134, 585.

Page B553, entry for \textit{font}\_base (6/14/87)

[Insert a reference to section 134.]

Page B555, right column, new entry (10/25/86)

Huge page..., 641.
Page B556, entry for *incr* (1/28/87)
[Add a reference to section 842.]

Page B557, entry for *is_char_node* (1/28/87)
[Delete the reference to section 881.]

Page B557, right column (6/14/87)

Page B560, right column (1/28/87)
\[
\text{max_in_open: } 11, 14, 304, 328.
\]

Page B561, left column, line 10 (4/15/87)

Page B561, left column (5/1/87)
Missing font identifier: 577.

Page B563, left column, line 2 (4/15/87)
136, 145, 149–154, 164, 168–169, 175–176, 182,

Page B563, right column (6/14/87)
oriental characters: 134, 585.

Page B569, right column, in appropriate places (10/12/86)
\[
\text{space: } 547, 558, 752, 755, 1042.
\text{space_shrink: } 547, 558, 1042.
\text{space_stretch: } 547, 558, 1042.
\]

Page B570, third-last line (1/28/87)
786, 795, 809, 819–820, 822, 837, 842–844, 866,

Page B571, right column (10/25/86)
The following...deleted, 641, 992, 1121.

Page B571, right column (4/7/87)
\[
\text{text_char: } 19, 20, 25, 47.
\]

Page B573, right column (5/1/87)
[Delete the entry for *Undefined font code*.]
Page B576, line 2 (1/28/87)
(Add the width of node s to \textit{break\_width} and increase t, unless it’s discardable 842)
Used in section 840.

Page B591, line 6 from the bottom (1/28/87)
(Subtract the width of node v from \textit{break\_width} 841) Used in section 840.

Page C14, top two lines (3/16/87)

The recursive midpoint rule for curve-drawing was discovered in 1959 by Paul de Casteljau, who showed that the curve could be described algebraically by the remarkably simple formula

Page C54, sixth-last to fourth-last lines (10/13/86)

Jonathan H. Quick (a student) used \texttt{\texttt{a\_plus1}} as the name of a variable at the beginning of his program; later he said \texttt{\texttt{let plus=+}}. How could he refer to the variable \texttt{\texttt{a\_plus1}} after that?

Page C76, line 14 (10/13/86)

\[ x_4 = w - .01in \] Point 4 should be one-hundredth of an inch inside

Page C103, line 12 (10/12/86)

\[ ht\# = body\_height\#; .5[ht\#, -dp\#] = axis\#; \]

Page C105, line 13 (10/13/86)

The vertical line just to the right of the italic left parenthesis shows the italic

Page C113, lines 20–27 (8/23/86)

The command \texttt{\texttt{erase fill c}} is an abbreviation for \texttt{\texttt{cullit; unfill c; cullit}}; this zeros out the pixel values inside the cyclic path \texttt{c}, and sets other pixel values to 1 if they were positive before erasing took place. (It works because the initial \texttt{cullit} makes all the values 0 or 1, then the \texttt{unfill} changes the values inside \texttt{c} to 0 or negative. The final \texttt{cullit} gets rid of the negative values, so that they won’t detract from future filling and drawing.) You can also use \texttt{\texttt{draw}}, \texttt{\texttt{filldraw}}, or \texttt{\texttt{drawdot}} with \texttt{\texttt{erase}}; for example, \texttt{\texttt{erase draw p}} is an abbreviation for \texttt{\texttt{cullit; undraw p; cullit}}, which uses the currently-picked-up pen as if it were an eraser applied to path \texttt{p}.

Page C124, line 9 (6/17/86)

\[ branch_2 = \texttt{flex}((30, 570), (10, 590), (-1, 616)) \]

Page C130, 3rd-last line (9/25/86)

\textit{Geometry} 1 (1986), 123–140: Given a sequence
Page C144, sixth line of the program (8/23/86)

\[ 6 \ y_2 = .1h; \ \text{top} \ y_3 = .4h; \]

Page C148, the line before the illustration (11/27/86)

are polygons with 32 and 40 sides, respectively:

[New illustrations are needed here, since METAfont version 1.3 improves the accuracy of pen polygons.]

Page C149, 7th line after the illustration (10/24/86)

\[(200, y + 100 \pm \alpha), \text{where} \ \alpha = \sqrt{5}/4 \approx 0.559. \text{If we digitize these outlines and fill the}\]

Page C178, second-last line (8/23/86)

(If \( t_3 = t_1 \) transum \( t_2 \), then \( z \) transformed \( t_3 = z \) transformed \( t_1 + z \) transformed \( t_2 \),

Page C198, fifth-last and fourth-last lines (10/13/86)

\[ \text{top} \ y_2 = \text{round}(\text{top} \ \beta). \]

Such operations occur frequently in practice, so plain METAfont provides convenient

Page C212, lines 9–11 from the bottom (8/23/86)

\[
| \text{point} \langle \text{numeric expression} \rangle \text{of} \langle \text{path primary} \rangle \\
| \text{precontrol} \langle \text{numeric expression} \rangle \text{of} \langle \text{path primary} \rangle \\
| \text{postcontrol} \langle \text{numeric expression} \rangle \text{of} \langle \text{path primary} \rangle 
\]

Page C233, lines 13–14 (2/15/87)

one column of white pixels, if the character is 2\( a \) pixels wide, because the right edge of
black pixels is specified here to have the \( x \) coordinate \( 2a - 1. \)

Page C247, lines 23–25 (11/27/86)

16.2. \texttt{ pencircle scaled 1.06060}’ is the diamond but \texttt{ pencircle scaled 1.06061}’ is the square. (This assumes that \texttt{fillin} = 0. If, for example, \texttt{fillin} = .1, the change doesn’t occur until the diameter is 1.20204.) The next change is at diameter 1.5, which

Page C262, lines 1–4 (7/28/86)

When we come to macros whose use has not yet been explained—for example, somehow \texttt{softjoin} and \texttt{stop} never made it into Chapters 1 through 27—we shall consider them from a user’s viewpoint. But most of the comments that follow are addressed to a potential base-file designer.

Page C266, line 16 (8/17/86)

variables; they have the side effect of changing the variable’s value.
Page C276, line 26 (6/23/86)

    if charic<>0: r((w+charic*hppp,h.o_), (w+charic*hppp,.5h.o_)); fi

Page C286, lines 24–26 (10/13/86)

    but \texttt{META}\texttt{FONT} won't let you. And even if this had worked, it wouldn't have solved the problem; it would simply have put \texttt{ENDFOR} into the replacement text of \texttt{ast}, because expansion is inhibited when the replacement text is being read.

Page C290, line 1 (8/23/86)

    2. \textit{Fortuitous loops}. The ‘max’ and ‘min’ macros in Appendix B make use of the fact

Page C298, third-last line (8/23/86)

    t[u_1,\ldots,u_n] = t[t[u_1,\ldots,u_{n-1}],t[u_2,\ldots,u_n]]

Page C304, 14th-last line (2/15/87)

    \texttt{[replace this \texttt{	extbackslash smallskip} by a \texttt{\smallskip} between lines!]} \\

Page C307, fifth-last line (12/7/86)

    \texttt{adjust\_fit((left sidebearing adjustment),(right sidebearing adjustment));}

Page C312, line 34 (10/12/86)


Page C316, lines 19–21 (8/17/86)

example, ‘(some charht values had to be adjusted by as much as 0.12pt)’ means that you had too many different nonzero heights, but \texttt{META}\texttt{FONT} found a way to reduce the number to at most 15 by changing some of them; none of them had to be specified by saying, e.g.,

Page C319, line 3 (8/23/86)

Page C321, line 6 (7/28/86)

    \texttt{special "identifier " & font_identifier_;}

Page C334, line 2 (6/23/86)

    \texttt{currentpicture := currentpicture shifted-(1,1); pix := currentpicture;}

Page C339, tenth-last line (2/4/87)

    Jackie K\=aren {\L}au\l{}a Mar\(\i{}\)a N\H{a}ta\{\l{}\}e \O{}ctave
Page C343, second-last line (8/23/86)
the precise needs of a precise but limited intellectual goal.

Page C346, 2nd line of entry for ‘;’ (1/12/87)

Page C348, line 6 (6/17/86)
concatenation, of paths, 70–71, 123, 127,

Page C348, just before ‘debugging’ (3/16/87)
de Casteljau, Paul de Faget, 14.

Page C348, right column (3/16/87)
[The entry for ‘define_whole_vertical_blacker_pixels’ should be moved up before the entry for ‘define_whole_vertical_pixels’.

Page C352, left column (6/1/87)
*kern, 97, 316, 317.

Page C352, right column (3/8/87)
[The entry for ‘lowres’ belongs before the entry for ‘lowres_fix’.

Page C353, left column (3/8/87)
[The entries for ‘mode’ and ‘⟨mode command⟩’ belong before the entry for ‘mode_def’.

Page C353, entry for mode_def (8/17/86)
mode_def, 94, 189, 270, 278–279.

Page C355, right column (4/15/86)
[The entry for ‘rulepen’ belongs before the entry for ‘rules’.

Page C355, right column (8/5/86)
screenstrokes, 191, 277.

Page C355, 2nd line of entry for ‘semicolons’ (1/12/87)

Page C356, full names for the Stanfords (4/10/86)
Stanford, Amasa Leland, 340.
Stanford, Jane Elizabeth Lathrop, 340.
[A number of entries were mistakenly omitted from the mini-indexes on the right-hand pages. Here is a combined list of all the missing items; you can mount it inside the back cover, say, as a secondary mini-index when the first one fails...]

add_or_subtract: procedure, §930.
after: array, §427.
arg_list: pointer, §720.
b: pixel_color, §580.
bad_exp: procedure, §824.
before: array, §427.
begin_name: procedure, §770.
bilin1: procedure, §968.
binary_mac: procedure, §863.
blank_rectangle: procedure, §567.
boc_c: integer, §1162.
boc_p: integer, §1162.
cf: fraction, §298.
clockwise: boolean, §453.
ct: fraction, §298.
cubic_intersection: procedure, §556.
cur_pen: pointer, §403.
cur_rounding_ptr: 0..max_wiggle, §427.
cur_spec: pointer, §403.
cur_x: scaled, §389.
cur_y: scaled, §389.
dely: integer, §557.
dep_finish: procedure, §935.
dep_list = macro, §587.
dimen_head: array, §1125.
dz: integer, §495.
dy: integer, §495.
d1: 0..1, §464.
end_name: procedure, §772.
eqth: array, §201.
error_stop_mode = 3, §68.
firm_up_the_line: procedure, §682.
get_next: procedure, §667.
gf_buf: array, §1152.
gf_offset: integer, §1152.
gf_ptr: gf_index, §1152.

halfword = min_halfword ..
max_halfword, §156.
hash: array, §201.
index = macro, §629.
input_in: function, §30.
interaction: 0..3, §68.
j: 0..move_size, §357.
known_pair: procedure, §872.
limit = macro, §629.
m_spread: integer, §357.
materialize_pen: procedure, §865.
max_allowed: scaled, §403.
max_c: array, §813.
max_link: array, §813.
max_tfm_dimen = scaled, §1130.
mem_top = macro, §12.
mem: array, §159.
memory_word = record, §156.
more_name: function, §771.
n1: integer, §464.
n: screen_col, §580.
n_sin_cos: procedure, §145.
name = macro, §629.
negate_deplist: procedure, §904.
new_knot: function, §871.
node_to_round: array, §427.
n1: integer, §464.
octant_dir: array, §395.
o1: small_number, §453.
o2: small_number, §453.
paint_row: procedure, §568.
param: array, §1096.
param_stack: array, §633.
path_length: function, §916.
perturbation: scaled, §1119.
phi: angle, §542.
pool_ptr: pool_pointer, §38.
post_head: pointer, §843.
pre_head: pointer, §843.
print_err = macro, §68.
print_macro_name: procedure, §722.
quarterword = 0..255, §156.
recycle_value: procedure, §809.
row_transition: trans_spec, §579.
scan_text_ary: procedure, §730.
scroll_mode = 2, §68.
set_controls: procedure, §299.
sf: fraction, §298.
show_context: procedure, §635.
sorted = macro, §325.
st: fraction, §298.
start = macro, §629.
start_sym: halfword, §1077.
str_pool: packed array, §38.
str_ptr: str_number, §38.
str_start: array, §38.
take_part: procedure, §910.

tfm_changed: integer, §1130.
tol: integer, §557.
t: small_number, §843.
tx: scaled, §954.
txx: scaled, §954.
txy: scaled, §954.
ty: scaled, §954.
tyx: scaled, §954.
tyy: scaled, §954.

unsorted = macro, §325.
w: 0..bstack_size, §557.
xy: 0..bstack_size, §557.
x1: scaled, §542.
x2: scaled, §542.
x3: scaled, §542.
y1: scaled, §542.
y2: scaled, §542.
y3: scaled, §542.
In general (4/6/87)

[The percent signs in all the comments (for example, on pages 7 and 42) are in the wrong font! Change ‘%’ to ‘%’.]

Page Dvii, line 9 (9/25/86)

Discrete and Computational Geometry 1 (1986), 123–140. Develops the theory

Page D2, line 27 (6/17/86)

\texttt{define banner \equiv \texttt{This is META FONT, Version 1.3}} \{ printed when META FONT starts \}

Page D18, line 30 (5/22/86)

\texttt{str_ptr: str_number;} \{ number of the current string being created \}

Page D23, second line of mini-index, right column (6/14/87)

\texttt{pool_name = "string", \S 11.}

Page D30, lines 33–34 (6/14/87)

to delete a token, and/or if some fatal error occurs while META FONT is trying to fix a non-fatal one. But such recursion is never more than two levels deep.

Page D63, lines 13–14 (5/5/87)

[These two lines can be eliminated, since the variable \texttt{temp_ptr} is no longer used! If you delete them, also remove \S 158 from the list of sections where global variables are declared (pages D7 and D552), and remove \texttt{temp_ptr} from the index on page D540.]

Page D66, line 6 (5/22/86)

\texttt{function get_node(s: integer): pointer;} \{ variable-size node allocation \}

Page D66, lines 31–32 (3/16/86)

controlled growth helps to keep the mem usage consecutive when META FONT is implemented on “virtual memory” systems.

Page D67, lines 7–8 (4/21/87)

\texttt{if r = p then if rlink(p) \neq p then} (Allocate entire node \texttt{p and goto found 171});

Page D86, second line of section 198 (2/27/87)

Individual class numbers have no semantic or syntactic significance, except in a few instances like ‘x’, or they can combine the structural properties of arrays and records, like ‘x20a.b’. A
In other words, variables have a hierarchical structure that includes enough threads running

[Variable \( r \) can be eliminated, since it is not used in this procedure! If you delete it, also remove 280 from the corresponding index entry on page D536.]

[This line can be eliminated, since \( \text{sine} \) and \( \text{cosine} \) are not used in this procedure! If you delete them, also remove 284 from the corresponding index entries on pages D538 and D521.]

\[(7 - \sqrt{28})/12; \text{the worst case occurs for polynomials like } B(0, 28 - 4\sqrt{28}, 14 - 5\sqrt{28}, 42; t).\]

The following code maintains the invariant relations \( 0 \leq x_0 < \max(x_1, x_1 + x_2) \), \( |x_1| < 2^{30} \),

\[\text{while } \text{max}_\text{coef} < \text{fraction}_\text{half} \text{ do}\]

The mini-index at the bottom of the next page should also receive the following new entry:

\( \text{fraction}_\text{half} = \text{macro}, \S 105. \)

[Also eliminate ‘\( q \)’ seven lines above this, and delete 497 from the index entry for \( q \) on page D536.]

\[\begin{align*}
\alpha & \leftarrow \text{abs}(u); \beta \leftarrow \text{abs}(v); \\
\text{if } \alpha < \beta \text{ then} & \quad \begin{aligned}
\alpha & \leftarrow \text{abs}(v); \beta \leftarrow \text{abs}(u); \\
\text{end; } & \quad \{ \text{now } \alpha = \max(|u|, |v|), \beta = \min(|u|, |v|) \}
\end{aligned} \\
\text{if internal[fillin]} \neq 0 \text{ then} & \quad d \leftarrow d - \text{take}_\text{fraction}(\text{internal[fillin]}, \text{make}_\text{fraction}(\text{beta} + \beta, \delta)); \\
& \quad d \leftarrow \text{take}_\text{fraction}((d + 4) \text{ div } 8, \delta); \alpha \leftarrow \alpha \text{ div half}\_\text{unit};
\end{align*}\]

instead of \textit{false}, the other routines will simply log the fact that they have been called; they won’t

Given the number \( k \) of an open window, the pixels of positive weight in \textit{cur_edges} will be shown
This line can be eliminated, since variable $s$ is not used in this procedure! If you delete it, also remove 652 from the corresponding index entry on page D537; remove 652 from the index entries for `param_size` and `param_start` on page D534; and remove `param_size` from the mini-index on page D301.

[These two mysterious lines should be deleted]

[Variables $q$ and $r$ can be eliminated, since they are not used in this procedure! If you delete them, also remove 862 from the corresponding index entries on page D536.]

Begin $p \leftarrow \text{cur\_exp};$

[Also eliminate line 12, and delete 985 from the index entry for $vv$ on page D543.]

This line can be eliminated, since variable $t$ is not used in this procedure! If you delete it, also remove 1059 from the corresponding index entry on page D540; remove 1059 from the index entries for `small_number` and `with_option` on pages D539 and D544; and remove `with_option` from the mini-index on page D455.

("Pretend that you're Miss Marple: Examine all clues,")

[Delete these two lines.]

depths, or italic corrections) are sorted; then the list of sorted values is perturbed, if necessary.

This program doesn’t bother to close the input files that may still be open.
Page D510, just before the fifth-last line (8/5/86)

\[\text{internal[fontmaking]} \leftarrow 0; \quad \{ \text{avoid loop in case of fatal error} \}\]

Page D520, right column (6/14/87)

Chinese characters: 1147.

Page D526, left column, lines 1–2 (7/30/86)

\[\text{fraction_half: } 105, 111, 152, 288, 408, 496, 543, 1098, 1128, 1141.\]

Page D526, left column, lines 6–7 (7/30/86)


Page D528, right column (6/14/87)

Japanese characters: 1147.

Page D530, right column, line 45 (7/30/86)

\[\text{max: } 539, 543.\]

Page D533, right column (6/14/87)

oriental characters: 1147.

Page D535, right column, line 27 (6/17/86)

1134, 1163–1165, 1182, 1194, 1200, 1205, 1213.

Page D547, bottom two lines (11/27/86)

[These lines, and the top two on the next page, should move down so that they appear in alphabetical order just before ‘Compute test coefficients’.]

Page Exiii, lines 1–2 (7/28/86)

February 11–13, 1984), 49. \textit{An example meta-character of the Devanagari alphabet, worked out “online” with the help of Matthew Carter.}

Page Exiii, line 6 (7/28/86)

\textit{and western alphabets work also for Devanagari and Tamil.}

Page E12, lines 15 and 19 (7/23/86)

[change ‘17.32’ to ‘17.28’ in both places]
Page E12, third-last line (12/18/86)
[change ‘41’ to ‘40’]

Page E13, lines 3, 4, and 20 (12/18/86)
[change ‘40’ to ‘41’, ‘48’ to ‘47’, ‘17’ to ‘7’]

Page E18, line 20 (7/23/86)
[change ‘17.32’ to ‘17.28’]

Page E18, line 29 (12/9/86)
[change ‘236’ to ‘212’ in the cmss9 column]

Page E170, top illustration (11/2/86)
[There should be no “dish” or depression in the vicinity of point 3r; the top edge of the character should be straight. This error appears also in the other uses of ‘no_dish_serif’ throughout the book, since the illustrations were made before ‘no_dish_serif’ was added to the program. See page E180 (twice at the top), E370 (twice), E374 (twice), E376 (twice), E378 (top), E390 (bottom), E398 (top), E402 (top), E406 (top), E453 (twice).]

Page E179, new line to be inserted after line 6 (10/13/86)
if shaved_stem < crisp.breadth: shaved_stem := crisp.breadth; fi

Page E219, line 29 (6/2/87)
top y_1 = h; x_1 = x_2; filldraw stroke z_1 e -- z_2 e; % stem

Page E279, seventh line from the bottom (7/20/86)
that delicious but restrained humor which her readers found so irresistible.

Page E301, new line to be inserted after line 28 (5/15/87)
if lower_side > 1.2 upper_side: upper_side := lower_side; fi

Page E554, bottom half of page (12/18/86)
[The letters will change slightly because of the corrections to cmr17 noted on pages 12 and 13.]

Page E561, line 3 (12/9/86)
[The numerals should be ‘0123456789’ (i.e., 2/3 point less tall) because of the correction made to page 18.]
Page E562, line 9 (12/9/86)

[The numerals should be ‘0123456789’ (i.e., 2/3 point less tall) because of the correction made to page 18.]

Page E572, entry for breadth (10/13/86)

breadth, 59, 75, 79, 91, 93, 179, 225, 233,

Page E573, entry for cmcsc10 (8/17/86)

cmcsc10, 30–31, 567.

Page E576, tenth-last line (5/15/87)

lowres_fix, 550.
This is a list of all corrections made to *Computers & Typesetting*, Volumes A–E, between 16 June 1987 and 20 February 1989. Corrections made to the softcover version of *The \TeX*book are the same as corrections to Volume A. Corrections to the softcover version of *The \METAFONT*book are the same as corrections to Volume C. Some of these corrections have already been made in reprints of the books. Some of these corrections affect the indexes and mini-indexes of Volumes B and D in ways not shown here. Corrections made up to 15 June 1987 appear in other files.

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Page A159, line 22  
(2/15/88)

`\nolimits` if the normal `\displaylimits` convention has been overridden; a Rad

Page A213, lines 34–35  
(12/23/87)

text will be a single control sequence token, defined to be like `\relax` if its meaning is currently undefined.

Page A299, line 30  
(7/6/88)

Fatal format file error; I’m stymied.

Page A326, line 12  
(12/12/87)

its natural width. The `\hbox` version also invokes `\everymath`.

Page A359, line 2  
(11/6/88)

`\mathchardef\ldotp=613A\mathchardef\cdotp=6201\mathchardef\colon=603A`

Page A359, lines 35–38  
(5/24/88)

`\def\updownarrow{\delimiter"326C33F } \def\arrowvert{\delimiter"033C000 }\def\Updownarrow{\delimiter"326D377 } \def\Arrowvert{\delimiter"033D000 }\def\vert{\delimiter"026A30C } \def\Vert{\delimiter"026B30D }\def\backslash{\delimiter"026E30F } \def\bracevert{\delimiter"033E000 }`

Page A364, line 35  
(11/6/88)

`\def\fmtname{plain}\def\fmtversion{2.94} % identifies the current format`

Page A379, line 15  
(10/12/87)

`\def\deleterightmost#1{\edef#1{\expandafter\xyzzy#1\xyzzy}}`
Consequently there was plenty of room for more macros: $52821 - 27618 = 25203$ unused cells of main memory, $2500 - 1172 = 1328$ of name memory, $1685 - 209 = 1476$ of string memory, and $17636 - 1659 = 15977$ of character memory. But a fairly large \TeX was being used, and only the macros of Appendices B and E were loaded; in other circumstances it might have been necessary to conserve space.

If a suitable starting letter is found, let it be in font $f$. Hyphenation is abandoned unless the \texttt{hyphenchar} of $f$ is between 0 and 255, and unless a character of that number exists in the font. If this test is passed, \TeX continues to scan forward until coming to something that’s not one of the following three “admissible items”: (1) a character in font $f$ whose \texttt{lccode} is nonzero; (2) a ligature formed entirely from characters of type (1); (3) an implicit kern. The first inadmissible item terminates this part of the process; the trial word consists of all the letters found in admissible items. Notice that all of these letters are in font $f$.

*\texttt{\day}, 273, 349, 406.

non-centered, 186, 326, 375–376, 420–421.

[Fatal format file error, 299.]
Page A473, entry for ‘page builder’ (8/13/87)
when exercised, 122, 280–283, 286–287.

Page A474, left column (12/27/88)
\texttt{parshape}, 101–102, 214, 271, 277, 283,

Page A480, right column (2/15/88)
vdots (\ldots), 177, 359.

Page A481, right column (7/3/87)
\texttt{z@}, 347, 348.
\texttt{z@skip}, 347, 348.

Page B2, line 32 (2/20/89)
\texttt{define banner \equiv \{} This is \TeX, Version 2.97 \} \{ printed when \TeX\ starts \}

Page B38, lines 7–9 from the bottom (11/6/88)
[Delete this paragraph; it is being moved to page B214.]

Page B38, line 5 from the bottom (12/14/88)
\begin{verbatim}
begin if log_opened then selector \leftarrow term_and_log
\end{verbatim}

Page B39, line 5 (12/14/88)
\begin{verbatim}
if log_opened then error;
\end{verbatim}

Page B52, line 5 (8/13/87)
cannot be done, i.e., if \texttt{hi_mem_min = lo_mem_max + 1}, we have to quit.

Page B54, lines 34–35 (7/9/88)
\begin{verbatim}
begin if hi_mem_min - lo_mem_max \geq 1998 then t \leftarrow lo_mem_max + 1000 
else t \leftarrow lo_mem_max + 1 + (hi_mem_min - lo_mem_max) \texttt{div} 2; 
\{ lo_mem_max + 2 \leq t < hi_mem_min \}
\end{verbatim}

Page B108, new line after line 8 (5/24/88)
\begin{verbatim}
d: integer; \{ number of characters in incomplete current string \}
\end{verbatim}
str_room(l); d ← cur_length;
while pool_ptr > str_start[str_ptr] do
    begin
        begin
            begin
                d ← cur_length;
                text(p) ← make_string; pool_ptr ← pool_ptr + d;
                for k ← j to j + l do append_char(buffer[k]);
                group_code = 0 . . max_group_code; { save_level for a level boundary }
            end; { move current string up to make room for another }
        end
    end
end

par_token: halfword; { token representing ‘\par’ }

358. The present point in the program is reached only when the expand routine has inserted

Delete the entry for ‘no_expand’; replace it by:
expand: procedure, §366.

cvl_backup, radix_backup, co_backup: small_number; { to save cur_val_level, etc. }
cur_order ← co_backup; backup_backup ← link(backup_head);
cur_order ← co_backup; link(backup_head) ← backup_backup;

cur_order: glue_ord, §447.

begin eq_define(cur_cs, relax, 256);

Delete the entries for ‘eqtb’ and ‘frozen_relax’; replace them by the following:
eq_define: procedure, §227.
relax = 0, §207.

repeat
    link(temp_head) ← null;
    if (info(r) > match_token + 127) ∨ (info(r) < match_token) then s ← null
    else begin
        match_chr ← info(r) − match_token; s ← link(r); r ← s; p ← temp_head; m ← 0;
    end

Page B177, bottom line before mini-index (7/13/88)

cur_val ← 0; cur_val_level ← int_val; radix ← 0; cur_order ← 0;

Page B181, line 31 (4/28/88)

[Change ‘x units per sp’ to ‘x sp per unit’! This change also should be made on line 1 of page B183 and line –8 of page B590.]

Page B188, line 8 (5/25/88)

function str_toks(b : pool_pointer): pointer;  { changes the string str_pool[b .. pool_ptr] to a token list }

Page B188, line 13 (5/25/88)

begin str_room(1); p ← temp_head; link(p) ← null; k ← b;

Page B188, line 20 (5/25/88)

pool_ptr ← b; str_toks ← p;

Page B188, new line after line 28 (5/25/88)

b: pool_pointer;  { base of temporary string }

Page B188, line 31 (5/25/88)

else begin old_setting ← selector; selector ← new_string; b ← pool_ptr;

Page B188, line 41 (5/25/88)

selector ← old_setting; the_toks ← str_toks(b);

Page B190, lines 16–18 (5/25/88)

b: pool_pointer;  { base of temporary string }

begin c ← cur_chr; (Scan the argument for command c 471);
old_setting ← selector; selector ← new_string; b ← pool_ptr; (Print the result of command c 472);
selector ← old_setting; link(garbage) ← str_toks(b); ins_list(link(temp_head));

Page B210, line 36 (5/25/88)

begin if (pool_ptr + name_length > pool_size) ∨ (str_ptr = max_strings) ∨ (cur_length > 0) then

Page B211, new line of code before the mini-index (12/14/88)

log_opened: boolean;  { has the transcript file been opened? }

Page B212, line 5 (12/14/88)

job_name ← 0; name_in_progress ← false; log_opened ← false;
Page B213, line 24

\[ \text{log.name} \leftarrow \text{a.make.name.string(log.file)}; \text{selector} \leftarrow \text{log.only}; \text{log.opened} \leftarrow \text{true}; \]

Page B214, lines 2 and 3

messages or even to show_context. The prompt_file_name routine can result in a fatal_error, but the error routine will not be invoked because log_opened will be false.

The normal idea of batch_mode is that nothing at all should be written on the terminal. However, in the unusual case that no log file could be opened, we make an exception and allow an explanatory message to be seen.

Page B214, lines 7–11 reduce to a single line

\[ \text{begin selector} \leftarrow \text{term_only}; \]

Page B224, second-last line

\[ \text{done: if file_opened then b_close(tfm_file);} \]

\[ \text{read_font_info} \leftarrow g; \]

Page B229, lines 6–8

than 2^{27}. If z < 2^{23}, the individual multiplications b \cdot z, c \cdot z, d \cdot z cannot overflow; otherwise we will divide z by 2, 4, 8, or 16, to obtain a multiplier less than 2^{23}, and we can compensate for this later. If z has thereby been replaced by z' = z/2^e, let \( \beta = 2^{4-e} \); we shall compute

Page B229, lines 11–12

if a = 0, or the same quantity minus \( \alpha = 2^{4+e}z' \) if a = 255. This calculation must be done exactly, in order to guarantee portability of \( \LaTeX \) between computers.

Page B230, lines 2–5

\[ \text{begin alpha} \leftarrow 16; \]

\[ \text{while} z \geq 40000000 \text{ do} \]

\[ \text{begin z} \leftarrow z \text{ div} 2; \alpha \leftarrow \alpha + \alpha; \text{ end; } \]

\[ \beta \leftarrow 256 \text{ div} \alpha; \alpha \leftarrow \alpha \ast z; \]

Page B245, new entry for mini-index

\text{cur.s: integer, \S616.}

Page B254, line 29

\text{cur.s: integer; \{ current depth of output box nesting, initially } -1 \} \]

Page B254, line 31

[Remove the statement `cur.s \leftarrow -1;' and put it on page B244 at the end of line 31.]
Page B259, line 13 (11/9/87)

\begin{verbatim}
begin rule wd ← rule wd + 10; \{ compensate for floating-point rounding \}
edge ← cur_h + rule wd; lx ← 0; \{ Let cur_h be the position of the first box, and set
\end{verbatim}

Page B259, line 17 (11/9/87)

\begin{verbatim}
cur_h ← edge − 10; goto next_p;
\end{verbatim}

Page B263, line 21 (11/9/87)

\begin{verbatim}
begin rule ht ← rule ht + 10; \{ compensate for floating-point rounding \}
edge ← cur_v + rule ht; lx ← 0; \{ Let cur_v be the position of the first box, and set
\end{verbatim}

Page B263, line 25 (11/9/87)

\begin{verbatim}
cur_v ← edge − 10; goto next_p;
\end{verbatim}

Page B266, line 8 (8/7/87)

\begin{verbatim}
dvi_out(eop); incr(total_pages); cur.s ← −1;
\end{verbatim}

Page B266, new code between lines 31 and 32 (8/7/87)

\begin{verbatim}
while cur.s > −1 do
begin if cur.s > 0 then dvi_out(pop)
else begin dvi_out(eop); incr(total_pages)
end;
decr(cur.s);
end;
\end{verbatim}

Page B285, line 21 (4/28/88)

is subsidiary to the \textit{nucleus} field of some noad; the dot is replaced by ‘\_’ or ‘\^’ or ‘\/' or ‘\\’ if \textit{p} is

Page B338, second-last line (8/19/87)

\begin{verbatim}
q ← link(head); s ← head;
\end{verbatim}

Page B339, line 4 (8/19/87)

\begin{verbatim}
s ← q; q ← link(q);
\end{verbatim}

Page B339, new code to insert after line 10 (8/19/87)

\begin{verbatim}
if o \neq 0 then
begin r ← link(q); link(q) ← null; q ← hpack(q, natural);
shift_amount(q) ← o; link(q) ← r; link(s) ← q;
end;
[These new lines also imply changes to the index that aren’t shown in this errata list.]
\end{verbatim}
is quite short. In the following code we set $hc[hn + 2]$ to the impossible value 128, in order to

\begin{verbatim}
hc[0] ← 127; hc[hn + 1] ← 127; hc[hn + 2] ← 128;  \{ insert delimiters \}
\end{verbatim}

Page B390, lines 17–18 (5/24/88)

(Enter as many hyphenation exceptions as are listed, until coming to a right brace; then \textbf{return} 961;)

[The same change applies to lines 20–21, and to page 582.]

Page B396, new line after line 34 (5/24/88)

\begin{verbatim}
trie_link(trie_size) ← 0; trie_back(0) ← trie_size;  \{ wrap around \}
\end{verbatim}

Page B396, bottom line (12/12/87)

\begin{verbatim}
trie_link(0) ← 0; trie_char(0) ← 0; trie_op(0) ← minQuarterword;
\end{verbatim}

Page B397, lines 15–17 (5/24/88)

\begin{verbatim}
begin c ← trie_c[p];
if c < trie_min then trie_min ← c;
if trie_min = 0 then z ← trie_link(trie_size)
else z ← trie_link(trie_min − 1);  \{ get the first conceivably good hole \}
\end{verbatim}

Page B400, lines 3–4 (5/24/88)

(Enter all of the patterns into a linked trie, until coming to a right brace 961) \equiv

[The same change applies to page B399, lines 29–30, and to page 582.]

Page B402, line 10 (5/24/88)

\begin{verbatim}
r ← trie_size;  \{ finally, we will zero out the holes \}
\end{verbatim}

Page B406, line 9 from the bottom (1/23/89)

\begin{verbatim}
shrink_order(r) ← normal; delete_glue_ref(q); glue_ptr(p) ← r; q ← r;
\end{verbatim}

Page B417, line 10 (1/23/89)

\begin{verbatim}
q ← new_skip_param(top_skip_code);  \{ now temp_ptr = glue_ptr(q) \}
\end{verbatim}

Page B418, line 14 (1/23/89)

\begin{verbatim}
shrink_order(r) ← normal; delete_glue_ref(q); glue_ptr(p) ← r; q ← r;
\end{verbatim}
Page B507, line 13 (12/14/88)
if log_opened then selector ← selector + 2;

Page B527, line 21 (12/14/88)
if log_opened then

Page B528, line 5 (12/14/88)
if log_opened then

Page B547, right column (9/20/87)
co_backup: 366.

Page B548, right column (9/20/87)
cur_order: 366, 447, 448, 454, 462.

Page B548, right column (8/7/87)
cur_s: 593, 616, 619, 629, 640, 642.

Page B551, both columns (12/23/87)

[Remove '372' from eqtb and put it into eq_define.]

Page B552, left column (4/28/88)

[Insert '358' into expand.]

Page B554, left column (12/23/87)

[Remove '372' from frozen_relax.]

Page B559, new entry (12/14/88)
log_opened, 92–93, 527, 528, 534–535, 1265, 1333–1334.

Page B559, right column (8/13/87)

[Delete the entry for low_mem_max.]  

Page B562, left column (4/28/88)

[Remove '358' from no_expand.]

Page B565, left column (8/7/87)
Page B567, left column (12/23/87)

[Insert ‘372’ into relax.]

Page B568, left column (4/28/88)

[Move ‘269’ from save_index to save_level.]

Page C26, bottom line (7/18/87)

What angle corresponds to the direction North-Northwest?

Page C107, line 13 (10/7/87)

**pickup penrazor** xscaled heavyline rotated \(\text{angle}(z_{32} - z_{31}) + 90\);

Page C164, line 10 (4/27/88)

\[
y_c = \text{top}_l;\ y_d = \text{y}_r;\ x_c = x_l - \text{left} \_\text{jut};\ x_d = x_r + \text{right} \_\text{jut};
\]

Page C175, line 23 (1/11/88)

expand into a sequence of tokens. (The language **SIMULA67** demonstrated that it is

Page C241, line 11 (5/25/88)

**numeric** \(ht\#,\ dp\#\); \(ht\# = \text{body} \_\text{height}\#\); \(0.5[ht\#, -dp\#] = \text{axis}\#\);

Page C248, line 21 becomes two lines (1/24/89)

which might not be numerically stable in the presence of rounding errors.) Another case, not really desirable, is left_jut = right_jut = 0.

Page C262, line 15 (12/23/88)

**string** base_name, base_version; base_name="plain"; base_version="1.7";

Page C271, line 12 (1/4/89)

the user and **METAfont**’s primitive picture commands. First, some important program

Page C271, line 4 from the bottom (12/23/88)

**def** cutdraw expr p = % caution: you may need autorounding=0

Page C272, lines 5 and 6 (12/23/88)

(cut_ scaled \((1+\max(\text{pen}_lft,\text{pen}_rt,\text{pen}_top,\text{pen}_bot))\)

rotated theta shifted z)t_;
Page C273, lines 20 and 22 (9/26/88)

\( (z_+ (0, \text{pen}\_\text{top} )) t_ = \text{round} ((z+ (0, \text{pen}\_\text{top} )) t_ ); z_ \ \text{enddef}; \)

\( (z_+ (0, \text{pen}\_\text{bot} )) t_ = \text{round} ((z+ (0, \text{pen}\_\text{bot} )) t_ ); z_ \ \text{enddef}; \)

Page C290, line 6 from the bottom (12/23/88)

(2) A throwaway variable, ‘\textit{whatever}’, nullifies an unwanted equation at the beginning

Page C331, just below the illustration (7/18/87)

Such a pattern is, of course, rather unlikely to occur in a \textit{gf} file, but \texttt{GFtoDVI} would

Page C337, line 11 (4/28/88)

An online “menu” of the available test routines will be typed at your terminal

Page C346, entry for \textit{autorounding} (12/23/88)


Page C350, left column (7/6/88)

\textit{Fatal base file error}, 226.

Page C356, left column (1/11/88)

\textit{SIMULA67 language}, 175.

Page C358, right column (2/15/88)

\textit{*yoffset}, 212, 220, 315, 324.

Page D2, line 27 (12/14/88)

\texttt{define banner \equiv `This\texttt{is}\_\texttt{META}\texttt{FON}\texttt{T}, \_\texttt{Version}\_\texttt{1.7}´} \ \{ printed when \texttt{META}\texttt{FON}\texttt{T} starts \}

Page D36, lines 3–5 (11/6/88)

[Delete this paragraph; it is being moved to page D349.]

Page D36, line 7 (12/14/88)

\texttt{begin if log\_opened then selector ↷ term\_and\_log}

Page D36, line 16 (12/14/88)

\texttt{if log\_opened then error;}

Page D66, lines 34–35 (7/9/88)

\texttt{begin if hi\_mem\_min – lo\_mem\_max ≥ 1998 then t ↷ lo\_mem\_max + 1000}

\texttt{else t ↷ lo\_mem\_max +1+(hi\_mem\_min – lo\_mem\_max) div 2; \ \{ lo\_mem\_max +2 ≤ t < hi\_mem\_min \}}
Page D347, new line of code after line 5 (12/14/88)

\[ \text{log}\_\text{opened}: \text{boolean}; \{ \text{has the transcript file been opened?} \}\]

Page D347, line 11 (12/14/88)

\[ \text{job}\_\text{name} \leftarrow 0; \; \text{log}\_\text{opened} \leftarrow \text{false}; \]

Page D348, line 4 from the bottom (12/14/88)

\[ \text{log}\_\text{name} \leftarrow \text{a}\_\text{make}\_\text{name}\_\text{string}(\text{log}\_\text{file}); \; \text{selector} \leftarrow \text{log}\_\text{only}; \; \text{log}\_\text{opened} \leftarrow \text{true}; \]

Page D349, lines 6 and 7 (12/14/88)

print error messages or even to \textit{show\_context}. The \textit{prompt\_file\_name} routine can result in a \textit{fatal\_error}, but the \textit{error} routine will not be invoked because \textit{log\_opened} will be false.

The normal idea of \textit{batch\_mode} is that nothing at all should be written on the terminal. However, in the unusual case that no log file could be opened, we make an exception and allow an explanatory message to be seen.

Page D349, lines 11–15 reduce to a single line (12/14/88)

\begin{verbatim}
\textbf{begin} \text{selector} \leftarrow \text{term\_only};
\end{verbatim}

Page D420, bottom line (5/25/88)

\[ \textbf{if} \; \text{txx} \; \textbf{mod} \; \text{unity} = 0 \; \textbf{then} \]

Page D441, delete line 2 and change line 12 as follows (5/25/88)

\begin{verbatim}
done: \textbf{if} \; \text{eq\_type}(x) \neq \text{tag\_token} \; \textbf{then} \; \text{clear\_symbol}(x, \text{false});
\quad \textbf{if} \; \text{equiv}(x) = \text{null} \; \textbf{then} \; \text{new\_root}(x);
\quad \text{scan\_declared\_variable} \leftarrow h;
\end{verbatim}

Page D444, line 8 from the bottom (12/14/88)

\[ \textbf{if} \; \text{log\_opened} \; \textbf{then} \; \text{selector} \leftarrow \text{selector} + 2; \]

Page D510, line 14 (12/14/88)

\[ \textbf{if} \; \text{log\_opened} \; \textbf{then} \]

Page D511, line 11 (12/14/88)

\[ \textbf{if} \; \text{log\_opened} \; \textbf{then} \]

Page D530, new entry (12/14/88)

\[ \text{log\_opened}, \; 87–88, \; 782, \; 783, \; 788–789, \; 1023, \; 1205, \; 1208. \]
Page D545, left column (10/31/87)

zscaled primitive: 893.
Zabala Salelles, Ignacio Andres: 812.

Page E32, second-last line (9/20/87)

after which comes ‘math_axis #; generate mathsy’ (which we won’t bother to

Page E111, line 29 (10/16/88)

lft x_{11} = hround u; x_{11} - x_{11} = x_{21} - x_{21} = x_{22} - x_{2r} = hround 1.6cap.jut;

Page E285, bottom line (12/1/87)

Due to Technical Developments (1968)

Page E333, lines 9–11 (1/9/89)

lft x_{11} = hround(2.5u - .5mfudged.stem); x_{11} = x_{11}' = x_{21} = x_{21}';
lft x_{31} = hround(.5w - .5mfudged.stem); x_{5} - x_{3} = x_{3} - x_{1};
if not monospace: r := hround(x_{5} + x_{1}) + r - w; fi % change width for better fit

Page E353, lines 38–39 (8/12/87)

else: fill diag.end(6r, 5r, 1, 1, 5l, 6l) -- .9[z_{5l}, z_{6l}]
   ..{z_{5} - z_{6}}.1[z_{5r}, z_{6r}] -- cycle; % middle stem

Page E387, line 13 (8/12/87)

pickup tiny.nib; bulb(3, 4, 5); % bulb

Page E413, lines 37–38 (8/12/87)

else: fill diag.end(6r, 5r, 1, 1, 5l, 6l) -- .9[z_{5l}, z_{6l}]
   ..{z_{5} - z_{6}}.1[z_{5r}, z_{6r}] -- cycle; % middle stem

Page E459, line 24 (8/7/87)

[Delete the ‘=’ sign between ‘lft’ and ‘x_{5}’.

Page E471, line 5 (12/11/88)

x_{2} = good.x .5w; center.on(x_{2});

Page E471, insert two lines below the rule at bottom of page (12/11/88)

def center.on(expr x) = if not monospace: % change width for symmetric fit
   r := r + 2x - w; w := 2x; fi enddef;
Page E477, line 20 (12/11/87)
\[ x_4 = x_8 = \text{good}\cdot x\cdot 5w; \quad \text{center}_\text{on}(x_4); \quad x_2 = w - x_6 = \text{good}\cdot x(x_4 + a); \]

Page E483, third line of elementary division operator (12/11/88)
\[ x_3 - .5\text{dot}_\text{size} = \text{hround}(.5w - .5\text{dot}_\text{size}); \quad \text{center}_\text{on}(x_3); \]

Page E485, line 4 (8/7/87)
[Delete the ‘=’ sign between ‘lft’ and ‘x’.]

Page E487, line 17 (8/4/88)
\[ \text{fill} \quad \text{fullcircle} \quad \text{scaled} \quad (\text{bold} + 3.8dw + \text{eps}) \quad \text{shifted} \quad (.5[z_4, z_8]); \]
% dot
[Also remove page 487 from the index entry for \text{dot}_\text{size}, and add it to the entries for \text{bold} and \text{dw}.]

Page E515, lines 5 and 12 (12/11/88)
\[ .5[x_1, x_2] = x_3 = \text{good}\cdot x\cdot 5w; \quad \text{center}_\text{on}(x_3); \quad lft \quad x_1 = \text{hround}(.5w - u \cdot \text{sqrt}48); \]

Page E515, line 21 (1/23/89)
\textbf{labels}(5, 6); \quad \text{zero}_\text{width}; \quad \textbf{endchar};
[Also put labels ‘5’ and ‘6’ on the upper right figure, page E514.]

Page E521, lines 4 and 14 (12/12/88)
\[ x_1 = x_2 = \text{good}\cdot x\cdot 5w; \quad \text{center}_\text{on}(x_1); \quad lft \quad x_3 = \text{hround} u; \quad x_4 = w - x_3; \]

Page E537, line 6 (12/11/88)
\[ x_1 = x_2 = x_3 = x_4; \quad x_1 - .5\text{stem} = \text{hround}(.5w - .5\text{stem}); \quad \text{center}_\text{on}(x_1); \]

Page E537, line 19 (12/11/88)
\[ x_1 = x_2 = x_3; \quad x_1 - .5\text{stem} = \text{hround}(.5w - .5\text{stem}); \quad \text{center}_\text{on}(x_1); \]

Page E539, line 4 (12/11/88)
\[ x_1 = x_4 = x_{30} = x_{33} = \text{good}\cdot x\cdot 5w; \quad \text{center}_\text{on}(x_1); \]

Page E539, line 21 (12/11/88)
\[ x_1 = x_4 = \text{good}\cdot x\cdot 5w; \quad \text{center}_\text{on}(x_1); \]

Page E541, line 4 (12/11/88)
\[ x_1 = x_5 = \text{good}\cdot x\cdot 5w; \quad \text{center}_\text{on}(x_1); \]
Page E541, line 17 (12/11/88)

\[ x_1 = x_{10} = \text{good}.x.5w; \text{ center(on}(x_1); \]

Page E550, new line after line 23 (8/15/87)

```
\text{forsuffixes } $ = \text{notch\_cut}, \text{cap\_notch\_cut}: \text{if } $ < 3: $ := 3; \text{fi endfor}
```

[To make room for this, combine lines 38 and 39 into a single line.]

Page E550, line 29 (7/9/88)

```
\text{define\_whole\_vertical\_blacker\_pixels}(\text{vair}, \text{bar}, \text{slab}, \text{cap\_bar}, \text{cap\_band});
```

Page E572, new entry at bottom (12/11/88)

```
\text{center\_on}, 471, 477, 483, 515, 521, 537–541.
```
This is a list of all corrections made to *Computers & Typesetting*, Volumes A–E, between 20 February 1989 and 30 September 1989 (when \TeX{} Version 3.0 and \METAfont{} Version 2.0 were fully defined). Corrections made to the softcover version of *The \TeX{}book* are the same as corrections to Volume A. Corrections to the softcover version of *The \METAfont{}book* are the same as corrections to Volume C. Some of these corrections have already been made in reprints of the books. Several minor changes to Volumes A and C are not shown here because they simply make room for the more substantive changes needed to describe the new features of \TeX{} Version 3.0 and \METAfont{} Version 2.0. Hundreds of changes will soon be made to Volumes B and D because of the upgrades to \TeX{} and \METAfont{}; it will unfortunately be impossible to document all of those changes. Therefore, readers who need up-to-date information on the \TeX{} and \METAfont{} programs should refer to the \WEB{} source files until new printings of Volumes B and D are issued.

Volume A, in general  
(9/23/89)

[Change ‘127’ to ‘255’ and ‘128’ to ‘256’ in contexts referring to character codes. This happens on pages 37(twice), 39, 41, 43, 44(twice), 48, 93, 154, 277, 305(twice), 308(twice), 313, and 343. Also change ‘7-bit’ to ‘8-bit’ on pages 214 and 277.]

Page A23, line 16  
(9/23/89)

This is \TeX{}, Version 3.0 (preloaded format=plain 89.7.15)

Page A34, new copy for bottom of page  
(9/23/89)

\errorcontextlines symbol has an internal code between 64 and 127, \TeX{} subtracts 64 from the code; if the code is between 0 and 63, \TeX{} adds 64. Hence code 127 can be typed \texttt{\textasciicircum \textasciicircum?}, and the dangerous bend sign can be obtained by saying \texttt{\manual\textasciicircum \textasciicircum?}. However, you must change the category code of character 127 before using it, since this character ordinarily has category 15 (invalid); say, e.g., \texttt{\catcode'\textasciicircum \textasciicircum?=12}. The \texttt{\textasciicircum \textasciicircum} notation is different from \texttt{\char}, because \texttt{\textasciicircum \textasciicircum} combinations are like single characters; for example, it would not be permissible to say \texttt{\catcode'\char127}, but \texttt{\textasciicircum \textasciicircum} symbols can even be used as letters within control words.
There's also a special convention in which `^^` is followed by two “lowercase hexadecimal digits,” 0–9 or a–f. With this convention, all 256 characters are obtainable in a uniform way, from `^^00` to `^^ff`. Character 127 is `^^7f`.

People who install T\TeX systems for use with non-American alphabets can make T\TeX conform to any desired standard. For example, suppose you have a Norwegian keyboard containing the letter æ, which comes in as code 241 (say). Your local format package should define `\catcode'æ=11`; then you could have control sequences like `\særtrykk`. Your \TeX input files could be made readable by American installations of \TeX that don’t have your keyboard, by substituting `^^f1` for character 241. (For example, the stated control sequence would appear as `\æ``f1rtrykk` in the file; your American friends should also be provided with the format that you used, with its `\catcode'^^f1=11`.) Of course you should also arrange your fonts so that \TeX’s character 241 will print as æ; and you should change \TeX’s hyphenation algorithm so that it will do correct Norwegian hyphenation. The main point is that such changes are not extremely difficult; nothing in the design of \TeX limits it to the American alphabet. Fine printing is obtained by fine tuning to the language or languages being used.

European languages can also be accommodated effectively with only a limited character set. For example, let’s consider Norwegian again, but suppose that

If \TeX sees a superscript character (category 7) in any state, and if that character is followed by another identical character, and if those two equal characters are followed by a character of code \( c < 128 \), then they are deleted and 64 is added to or subtracted from the code \( c \). (Thus, `^^A` is replaced by a single character whose code is 1, etc., as explained earlier.) However, if the two superscript characters are immediately followed by two of the lowercase hexadecimal digits `0123456789abcdef`, the four-character sequence is replaced by a single character having the specified hexadecimal code. The replacement is carried out also if such a trio or quartet of characters is encountered during steps (b) or (c) of the control-sequence-name scanning procedure described above. After the replacement is made, \TeX begins again as if the new character had been present all the time. If a superscript character is not the first of such a trio or quartet, it is handled by the following rule.

If \TeX sees a character of categories 1, 2, 3, 4, 6, 8, 11, 12, or 13, or a character of category 7 that is not the first of a special sequence as just described, it converts the character to a token by attaching the category code, and goes into state \( M \). This is the normal case; almost every nonblank character is handled by this rule.
the input line ' $x^2$~ \TeX ^^62^^6'?

For example, a well-designed \TeX font for French might well treat accents as lig-

\TeX does not assign any value to \texttt{sfcode'042}.

If you want to avoid overfull boxes at all costs without trying to fix them manu-
ally, you might be tempted to set \texttt{tolerance=10000}; this allows arbitrarily bad lines to be acceptable in tough situations. But infinite tolerance is a bad idea, because \TeX doesn’t distinguish between terribly bad and preposterously horrible lines. Indeed, a tolerance of 10000 encourages \TeX to concentrate all the badness in one place, making one truly unsightly line instead of two moderately bad ones, because a single “write-off” produces fewest total demerits according to the rules. There’s a much better way to get the desired effect: \TeX has a parameter called \texttt{emergencystretch} that is added to the assumed stretchability of every line when badness and demerits are computed, in cases where overfull boxes are otherwise unavoidable. If \texttt{emergencystretch} is positive, \TeX will make a third pass over a paragraph before choosing the line breaks, when the first passes did not find a way to satisfy the \texttt{pretolerance} and \texttt{tolerance}. The effect of \texttt{emergencystretch} is to scale down the badnesses so that large infinities are distinguishable from smaller ones. By setting \texttt{emergencystretch} high enough (based on \texttt{hsize}) you can be sure that the \texttt{tolerance} is never exceeded; hence overfull boxes will never occur unless the line-breaking task is truly impossible.

If you have two or more \texttt{topinsert} or \texttt{pageinsert} commands in quick suc-
cession, \TeX may need to carry them over to several subsequent pages; but they will retain their relative order when they are carried over. For example, suppose you have pages that are nine inches tall, and suppose you have already specified 4 inches of text for some page, say page 25. Then suppose you make seven \texttt{topinserts} in a row, of

When the best page break is finally chosen, \TeX removes everything after the chosen breakpoint from the bottom of the “current page,” and puts it all back at the top of the “recent contributions.” The chosen breakpoint itself is placed at the very top of the recent contributions. If it is a penalty item, the value of the penalty is recorded in \texttt{outputpenalty} and the penalty in the contribution list is changed to 10000; otherwise \texttt{outputpenalty} is set to 10000. The insertions that remain on the current page are of three kinds: For each class $n$ there are unsplit insertions, followed possibly by a single split insertion, followed possibly by others. If \texttt{holdinginserts > 0},
all insertions remain in place (so that they might be contributed again); otherwise they are all removed from the current page list as follows: The unsplit insertions are appended to \box n, with no interline glue between them. (Struts should be used, as in the \footnote macro of Appendix B.) If a split insertion is present, it is effectively \vsplit to the size that was computed previously in Step 4; the top part is treated as an unsplit insertion, and the remainder (if any) is converted to an insertion as if it had not been split. This remainder, followed by any other floating insertions of the same class, is held over in a separate place. (They will show up on the “current page” if \showlists is used while an \output routine is active; the total number of such insertions appears in \insertpenalties during an \output routine.) Finally, the remaining items before the best break on the current page are put together in a \vbox

Page A131, line 12 (9/22/89)

work fine; but sometimes you want to have uniformity between different members of a

Page A155, lines 3–5 (9/23/89)

when it encounters a character that is given explicitly as \char(number).

Page A214, lines 19–24 (9/23/89)

\the\langle special register\rangle, where \langle special register\rangle is one of the integer quantities \prevgraf, \deadcycles, \insertpenalties, \inputlineno, \badness, or \parshape (denoting only the number of lines of \parshape); or one of the dimensions \pagetotal, \pagegoal, \pagestretch, \pagefillstretch, \pagefillstretch, \pagemode, \pagedepth. In horizontal modes you can also refer to a special integer, \the\spacefactor; in vertical modes there’s a special dimension, \the\prevdepth.

Page A229, new copy after line 11 (9/23/89)

TwX will report the badness of glue setting in a box if you ask for the numeric quantity \badness after making a box. For example, you might say

\setbox0=\line{\trialtexta}
\ifnum\badness>250 \setbox0=\line{\trialtextb}\fi

The badness is between 0 and 10000 unless the box is overfull, when \badness=1000000.

Page A271, lines 17–20 (9/23/89)

| \langle countdef token \rangle | \count\langle 8-bit number \rangle | \langle codename\rangle\langle 8-bit number \rangle |
| \langle chardef token \rangle | \langle mathchardef token \rangle | \parshape | \inputlineno
| \hyphenchar\langle font \rangle | \skewchar\langle font \rangle | \badness

Page A272, lines 3–4 (9/23/89)

value is between 0 and \(2^8 - 1 = 255\); a \langle 4-bit number \rangle is similar.
\holdinginserts (positive if insertions remain dormant in output box)

\language (the current set of hyphenation rules)

\lefthyphenmin (smallest fragment at beginning of hyphenated word)

\righthyphenmin (smallest fragment at end of hyphenated word)

\errorcontextlines (maximum extra context shown when errors occur)

\emergencystretch (reduces badnesses on final pass of line-breaking)

That makes a total of 103 parameters of all five kinds.

\noboundary \unhbox \unhcopy \valign \vrule

\langle \text{letter} \rangle , \langle \text{otherchar} \rangle , \langle \text{8-bit number} \rangle , \langle \text{chardef token} \rangle , \noboundary. The most common commands of all are the character commands that tell \TeX to append a character to the current horizontal list, using the current font. If two or more commands of this type occur in succession, \TeX processes them all as a unit, converting to ligatures and/or inserting kerns as directed by the font information. (Ligatures and kerns may be influenced by invisible “boundary” characters at the left and right, unless \noboundary appears.) Each character command adjusts \spacefactor, using the \scode table as described in Chapter 12. In unrestricted horizontal mode, a ‘\discretionary{}{}{}’ item is appended after a character whose code is the \hyphenchar of its font, or after a ligature formed from a sequence that ends with such a character.

\setlanguage⟨number⟩. See the conclusion of Appendix H.

$2^{15} - 1$. This is done by replacing the character number by its \mathcode value. If the \mathcode value turns out to be 32768 = "8000, however, the ⟨character⟩ is replaced by an active character token having the original character code (0 to 255); \TeX forgets the original ⟨character⟩ and expands this active character according to the rules of Chapter 20.
\noboundary. This command is redundant and therefore has no effect; boundary ligatures are automatically disabled in math modes.

[There should be a \(^3\) just above the ‘3’ in the line below. This was mistakenly dropped by the printer some time during 1985; it was correct in the first two printings and it has always been correct inside the computer!]

8.4. $3 x_{11} \sim_7 2_{12} $3 $13 10 \TeX$ $b_{12} v_{12} 10$. The final space comes from the \texttt{return} placed at the end of the line. Code \texttt{^6} yields \texttt{v} only when not followed by 0–9 or a–f. The initial space is ignored, because state \texttt{N} governs the beginning of the line.

The English word ‘eighteen’ might deserve similar treatment. \TeX’s hyphenation algorithm will not make such spelling changes automatically.

\def\clearnotenumber{\notenumber=0\relax}

\def\overpaid{{\count0=\balance}

badness rating of a box is at most 10000, except that the \texttt{badness} of an overfull box is 1000000. \texttt{INITEX} initializes \texttt{tolerance} to 10000, thereby making all line breaks feasible. Penalties of 10000 or more prohibit breaks; penalties of −10000 or less make breaks mandatory. The cost of a page break is 100000, if the badness is 10000 and if the associated penalties are less than 10000 in magnitude (see Chapter 15).
or \spacefactor or \sfcode value must be less than $2^{15}$; a \mathcode or \mag value must be less than or equal to $2^{15}$, and $2^{15}$ denotes an “active” math character. There are $2^{16}$ sp per pt. A \delcode value must be less than $2^{24}$; a \delimiter, less than $2^{27}$. The \end command sometimes contributes a penalty of $-2^{30}$ to the current page. A ⟨dimen⟩ must be less than $2^{30}$ sp in absolute value; a ⟨number⟩ must be less than $2^{31}$ in absolute value.

Page A348, line 12 from the bottom (9/23/89)
\showboxbreadth=5 \showboxdepth=3 \errorcontextlines=5

Page A364, insert before line 18 from the bottom (9/23/89)
\lefthyphenmin=2 \righthyphenmin=3 \% disallow x- or -xx breaks

Page A364, line 5 from the bottom (9/23/89)
\def\fmtname{plain}\def\fmtversion{3.0} \% identifies the current format

Page A369, insert before line 5 from the bottom (9/23/89)

Modern keyboards allow 256 codes to be input, not just 128; so \TeX represents characters internally as numbers in the range 0–255 (i.e., ‘000–‘377, or ”00–”FF). Implementations of \TeX differ in which characters they will accept in input files and which they will transmit to output files; these subsets can be specified independently. A completely permissive version of \TeX allows full 256-character input and output; other versions might ignore all but the visible characters of ASCII; still other versions might distinguish the tab character (code ‘011) from a space on input, but might output each tab as a sequence of three characters ^I.

Page A370, lines 3–7 (9/23/89)
close as possible to the ASCII conventions. (b) Make sure that codes ‘041–‘046, ‘060–‘071, ‘141–‘146, and ‘160–‘171 are present and that each unrepresentable internal code < ‘200 leads to a representable code when ‘100 is added or subtracted; then all 256 codes can be input and output. (c) Cooperate with everyone else who shares the same constraints, so that you all adopt the same policy. (See Appendix J for information about the \TeX Users Group.)

Page A370, bottom line (9/23/89)
doesn’t matter if these symbols have their plain \TeX meanings or not. (6) There is a special convention for representing characters 0–255 in the hexadecimal forms ^00–^ff, explained in Chapter 8. This convention is always acceptable as input, when ^ is any character of catcode 7. Text output is produced with this convention only when representing characters of code ≥ 128 that a \TeX installer has chosen not to output directly.

Page A385, line 8 (5/14/89)
\def\beginbox{\setbox0=\hbox\bgroup}
page prematurely if you want to pass a signal. (Set \holdinginserts positive to pass a signal when the contents of \box255 will be sent back through the page builder again, if any insertions are present.)

shortened or lengthened anyway; book preparation with \TeX, as with type, encourages interaction between humans and machines.) The lines of the quotations are set flush right by using \obeylines together with a stretchable \leftskip:

following one, using the specified family and the current size, then insert the ligature character and continue as specified by the font; two characters may collapse into one, or a new character may appear. Otherwise if the font information shows a kern between the current symbol and the next, insert a kern item after the current Ord atom and move to the next item after that. Otherwise (i.e., if no ligature or kern is specified between the present text symbol and the following character), go to Rule 17.

Exception: The character ‘.’ is treated as if it were a ⟨letter⟩ of code 0 when it appears in a pattern. Code 0 (which obviously cannot match a nonzero \lccode) is used by \TeX to represent the left or right edge of a word when it is being hyphenated.

If a trial word $l_1 \ldots l_n$ has been found by this process, hyphenation will still be abandoned unless $n \geq \lambda + \rho$, where $\lambda = \max(1, \lefthyphenmin)$ and $\rho = \max(1, \righthyphenmin)$. (Plain \TeX takes $\lambda = 2$ and $\rho = 3$.) Furthermore, the items immediately following the trial word must consist of zero or more characters, ligatures, and implicit kerns, followed immediately by either glue or an explicit kern or a penalty item or a whatsit or an item of vertical mode material from \mark, \insert, or \vadjust. Thus, a box or rule or math formula or discretionary following too closely upon the trial word will inhibit hyphenation. (Since \TeX inserts empty discretionaries after explicit hyphens, these rules imply that already-hyphenated compound words will not be further hyphenated by the algorithm.)
So far we have assumed that \TeX{} knows only one style of hyphenation at a
time; but in fact \TeX{} can remember up to 256 distinct sets of rules, if you have
enough memory in your computer. An integer parameter called \texttt{\language{}} selects the
rules actually used; every \texttt{\hyphenation{}} and \texttt{\patterns{}} specification appends new rules
to those previously given for the current value of \texttt{\language{}}. (If \texttt{\language{}} is negative
or greater than 255, \TeX{} acts as if \texttt{\language{}} = 0.) All \texttt{\patterns{}} for all languages
must be given before a paragraph is typeset, if \texttt{INITEX} is used for typesetting.

\TeX{} is able to work with several languages in the same paragraph, be-
cause it operates as follows. At the beginning of a paragraph the “cur-
rent language” is defined to be 0. Whenever a character is added to the cur-
rent paragraph (i.e., in unrestricted horizontal mode), the current language is com-
pared to \texttt{\language{}}; if they differ, the current language is reset and a whatsit node speci-
fying the new current language is inserted before the character. Thus, if you say
\texttt{\def\french{\language1...}}’ and ‘mix \french{} franc/ais with English’, \TeX{} will put whatsit
s before the \texttt{f} and the \texttt{w}; hence it will use language 1 rules when hy-
phenating \texttt{franc/ais}, after which it will revert to language 0. You can insert the what-
sit yourself (even in restricted horizontal mode) by saying \texttt{\setlanguage{\langle number\rangle}}; this
changes the current language but it does not change \texttt{\language{}}.
Page A467, entry for 'hexadecimal' (9/23/89)
[Add pages 45, 47–48 to this entry.]

Page A467, right column (9/23/89)
* \holdinginserts, 125, 273, 400.

Page A467, bottom line (9/23/89)
* \hyphenation, 277, 419, 452–453, 455.

Page A468, right column (9/23/89)
infinite badness, 97, 107, 111, 229, 317.

Page A468, right column (9/23/89)
* \inputlineno, 214, 271.

Page A469, entry for kerns (9/23/89)
[Add pages 286 and 444 to this entry.]

Page A469, left column (9/23/89)
* \language (hyphenation method), 273, 455.

Page A469, right column (9/23/89)
* \lefthyphenmin, 273, 364, 454.

Page A470, entry for ligatures (9/23/89)
[Add pages 286 and 444 to this entry.]

Page A472, left column (9/23/89)
* \noboundary, 283, 286, 290.

Page A473, right column (9/23/89)
overfull boxes, 27–30, 94, 229, 238,
avoiding, 107.

Page A474, left column (9/23/89)
* \patterns, 277, 453, 455.

Page A476, left column (9/23/89)
* \righthyphenmin, 273, 364, 454.
\*\setlanguage, 287, 455.
\*\showboxbreadth, 273, 302, 303, 348.
\*\showboxdepth, 79, 273, 302, 303, 348.

\[1/2, 67, 332.\]
\[1/2, \text{ in unslashed form, 141, 186}.\]
\[(4\text{-bit number}), 271.\]
\[(8\text{-bit number}), 271, 276–278.\]
\[(15\text{-bit number}), 271, 277, 289, 291.\]
\[(27\text{-bit number}), 271, 289, 291.\]

[Delete these two lines, as TUG’s address is no longer c/o AMS.]

\textit{WEB} documentation for four utility programs that are often used in conjunction with \TeX: \textsc{pooltype}, \textsc{tftopl}, \textsc{pltotf}, and \textsc{dvi}. 

\textbf{Page B2, line 32} \hspace{1cm} (6/20/89)

\textit{define} \texttt{banner} \equiv \texttt{´This is \TeX, Version 2.991´} \{ printed when \TeX \ starts \}

\textbf{Page B118, lines 2–4} \hspace{1cm} (3/2/89)

\begin{verbatim}
\textbf{begin if} \texttt{cur_level > level_one} \textbf{then}
\textbf{begin check_full_save_stack; save_type(save_ptr) \leftarrow insert_token; save_level(save_ptr) \leftarrow level_zero; save_index(save_ptr) \leftarrow t; incr(save_ptr); end; }
\end{verbatim}

\textbf{Page B182, line 13 becomes two lines} \hspace{1cm} (6/20/89)

\texttt{k, kk: small_number;} \hspace{1cm} \{ number of digits in a decimal fraction \}
\texttt{p, q: pointer;} \hspace{1cm} \{ top of decimal digit stack \}

\textbf{Page B182, line 15 from the bottom} \hspace{1cm} (6/20/89)

\begin{verbatim}
\textbf{begin k \leftarrow 0; p \leftarrow null; get_token;} \hspace{1cm} \{ \text{point_token is being re-scanned} \}
\end{verbatim}
\begin{verbatim}
begin q ← get avail; link(q) ← p; info(q) ← cur_tok − zero_token; p ← q; incr(k);
\end{verbatim}

\begin{verbatim}
done1: for kk ← k downto 1 do
begin dig[kk − 1] ← info(p); q ← p; p ← link(p); free_avail(q);
end;
f ← round_decimals(k);
\end{verbatim}

\begin{verbatim}
begin if cur_align = null then confusion(´endv´);
q ← link(cur_align); if q = null then confusion(´endv´);
\end{verbatim}

\begin{verbatim}
begin if cur_group = math_shift_group then init_align
else off_save;
\end{verbatim}

\begin{verbatim}
undump(lo_mem_stat_max + 1)(lo_mem_max)(rover); p ← mem_bot; q ← rover;
\end{verbatim}

\begin{verbatim}
[Change ‘127’ to ‘255’ and ‘128’ to ‘256’ in contexts referring to character codes. This happens on pages 188(thrice) and 251.]
\end{verbatim}

```
\mode=cheapo; input newface
```
and the same file should also produce a high-resolution font if we start with

so that \texttt{currenttransform} multiplies all \texttt{y} coordinates by \texttt{aspect\_ratio}, when paths are

```
boundarychar  the right boundary character for ligatures and kerns
```

All of these quantities are numeric. They are initially zero at the start of a job, except for \texttt{year}, \texttt{month}, \texttt{day}, and \texttt{time}, which are initialized to the time the run began; furthermore, \texttt{boundarychar} is initially \texttt{-1}. A \texttt{granularity} of zero is equivalent to \texttt{granularity} = 1. A preloaded base file like plain \texttt{METAfont} will usually give nonzero values to several other internal quantities on this list.
Page C259, lines 16 and 17 from the bottom (5/14/89)

screenchars; screenstrokes; imagerules; gfcorners; nodisplays; notransforms; input \langle filename \rangle.

Page C282, the three lines following the chart (9/30/89)

METAfont can also be configured to accept any or all of the character codes 128–255. However, METAfont programs that make use of anything in addition to the 95 standard ASCII characters cannot be expected to run on other systems, so the use of extended character sets is discouraged.

Page C316, bottom 14 lines and top 30 of page C317 (9/30/89)

Ligature information and kerning information is specified in short “ligtable programs” of a particularly simple form. Here’s an example that illustrates most of the features (although it is not a serious example of typographic practice):

\begin{verbatim}
ligtable "f": "f" =: oct"013", "i" |=: oct"020", skipto 1;
ligtable "o": "b": "p": "e" kern .5u#, "o" kern .5u#, "x" kern-.5u#, 1:: "!" kern u#;
\end{verbatim}

This sequence of instructions can be paraphrased as follows:

Dear \TeX{}, when you’re typesetting an ‘f’ with this font, and when the following character also belongs to this font, look at it closely because you might need to do something special: If that following character is another ‘f’, replace the two f’s by character code oct"013" [namely ‘ff’]; if it’s an ‘i’, retain the ‘f’ but replace the ‘i’ by character code oct"020" [a dotless ‘ı’]; otherwise skip down to label ‘1::’ for further instructions. When you’re typesetting an ‘o’ or ‘b’ or ‘p’, if the next input to \TeX{} is ‘e’ or ‘o’, add a half unit of space between the letters; if it’s an ‘x’, subtract a half unit; if it’s an exclamation point, add a full unit. The last instruction applies also to exclamation points following ‘f’ (because of the label ‘1::’).

When a character code appears in front of a colon, the colon “labels” the starting place for that character’s ligature and kerning program, which continues to the end of the ligtable statement. A double colon denotes a “local label”; a \texttt{skipto} instruction advances to the next matching local label, which must appear before 128 ligtable steps intervene. The special label ‘1::’ can be used to initiate ligtable instructions for an invisible “left boundary character” that is implicitly present just before every word; an invisible “right boundary character” equal to \texttt{boundarychar} is also implicitly present just after every word, if \texttt{boundarychar} lies between 0 and 255.

The general syntax for ligtable programs is pretty easy to guess from these examples, but we ought to exhibit it for completeness:

\begin{verbatim}
⟨ligtable command⟩ → ligtable ⟨ligtable program⟩⟨optional skip⟩
⟨ligtable program⟩ → ⟨ligtable step⟩ | ⟨ligtable program⟩, ⟨ligtable step⟩
⟨optional skip⟩ → , skipto ⟨code⟩ | ⟨empty⟩
\end{verbatim}
A ⟨code⟩ should have a numeric value between 0 and 255, inclusive, after having been rounded to the nearest integer; or it should be a string of length 1, in which case it denotes the corresponding ASCII code (Appendix C). For example, "A" and 64.61 both specify the code value 65. Vertical bars to the left or right of ‘=:' tell T\(\text{E}\)X to retain the original left and/or right character that invoked a ligature. Additional ‘>' signs tell T\(\text{E}\)X to advance its focus of attention instead of doing any further ligtable operations at the current character position.

Page C338, lines 21 and 22 (9/30/89) and 127–255 have to be specified with the ‘#' option, on non-fancy installations of T\(\text{E}\)X, and so does code 35 (which is the ASCII code of ‘#' itself).

Page C346, left column, after line 14 (9/30/89)

\[
*|=:, 316, 317.
*|=:> 317.
*=: 317.
*=:| 317.
*=:|> 317.
*=:|> 317.
*=:|>> 317.
\]

Page C346, left column, after line 31 (9/30/89)

\[
*: (local label), 317.
*|\phantom{=} (left boundary label), 317.
\]

Page C347, left column (9/30/89)

\*
boundarychar, 212, 317.

Page C352, left column (9/30/89)

[Change ‘⟨ligature replacement⟩’ to ‘⟨ligature op⟩’.]

Page C354, left column (9/30/89)

\[
⟨\text{optional skip}⟩, 217.
\]

Page C356, left column (9/30/89)

\[
*skipto, 316, 317.
\]
Page Dvi, bottom two lines, and top lines of page vii (4/21/89)

- “METAFONTware” by Donald E. Knuth, Tomas G. Rokicki, and Arthur L. Samuel, Stanford Computer Science Report 1255 (Stanford, California, April 1989), 207 pp. The WEB programs for four utility programs that are often used in conjunction with METAFONT: GFtype, GFtoPK, GFtoDVI, and MFT.

Page D63, line 9 (8/31/89)

mem, so we allow pointers to assume any halfword value. The minimum memory index represents

Page D63, line 28 (8/31/89)

null = mem_min < lo_mem_max < hi_mem_min < mem_top ≤ mem_end ≤ mem_max.

Page D67, in the July 1987 printing (4/7/89)

[Delete line 7, which has a redundant ‘if r = p then’; move line 8 to the left 10 points for alignment; and restore the following line (which was deleted by mistake after line 8):

node_size(p) ← q − p  { reset the size in case it grew }

These corrections are needed only in the reprinting made July, 1987.]

Page D228, in the July 1987 printing (4/7/89)

[Delete lines 14–15, which were inserted erroneously from a previous errata list; and restore the following lines (which were deleted by mistake):

begin double(max_coef); double(x0); double(x1); double(x2);
double(y0); double(y1); double(y2);
end

These corrections are needed only in the reprinting made July, 1987.]

Page D248, in the July 1987 printing (4/7/89)

[Delete line 16, which begins with ‘d ← take_fraction’; and restore the following line (which was deleted by mistake after line 22):

if d < alpha then d ← alpha

These corrections are needed only in the reprinting made July, 1987.]

Page D389, line 10 (6/20/89)

help1(“The expression above should have been a number”,>=3/4.”);

Page D504, line 25 (8/31/89)

undump(lo_mem_stat_max + 1)(lo_mem_max)(rover); p ← mem_min; q ← rover;

Page D510, in the July 1987 printing (4/7/89)

[Move the 7th-to-last line, which begins with ‘internal [fontmaking]’, one line down, and indent it to the right by 10 more points. This correction is needed only in the reprinting made July, 1987.]
"Metamarks: Preliminary studies for a Pandora’s Box of shapes" by Neenie Billawala, Stanford Computer Science Report 1256 (Stanford, California, May 1989), 132 pp. Lavishly illustrated studies in parameter variation, leading to the design of a new family of typefaces called Pandora.

math_fit(−.3cap_height* slant − .5u#, ic#);
penlabels(1, 2, 3, 4, 5, 6, 7, 8); endchar;

[some points and labels are missing at the tip of the tail on page 400]
This is a list of all corrections made to *Computers & Typesetting*, Volumes A, C, and E, between 30 September 1989 (when the revisions for Te\TeX\ Version 3.0 and METAFONT Version 2.0 were made) and December 31, 1990. Corrections made to the softcover version of *The \TeX\book* are the same as corrections to Volume A. Corrections to the softcover version of *The METAFONTbook* are the same as corrections to Volume C. Some of the corrections below have already been made in reprints of the books. Hundreds of changes, too many to list here, have been made to Volumes B and D because of the upgrades to Te\TeX\ and METAFONT. Readers who need up-to-date information on the Te\TeX\ and METAFONT programs should refer to the WEB source files until new printings of Volumes B and D are issued.

Page A99, line 4 from the bottom (2/22/90)

to be chosen because there was no feasible way to keep total demerits small.

Page A124, lines 18–21 (9/5/90)
Floating insertions can be accommodated as a special case of split insertions, by making each floating topinsert start with a small penalty, and by having zero as the associated \texttt{\textbackslash floatingpenalty}; non-floating insertions like footnotes are accommodated by associating larger penalties with split insertions (see Appendix B).

Page A137, lines 2 and 3 from the bottom (11/9/90)

and you shouldn’t even be reading this manual, which is undoubtedly all English to you.

Page A141, line 15 from the bottom (10/18/90)
Thus if you type ‘\$1\over2\$’ (in a text) you get $\frac{1}{2}$, namely style \textit{S} over style \textit{S}’;

Page A156, line 2 (11/18/89)

Commands like \texttt{\textbackslash mathchardef\alpha=\textasciitilde010B} are used in Appendix B to define

Page A165, lines 2–3 (8/13/90)

Type the formula $\mathbf{x}^T\mathbf{Mx} = 0 \iff \mathbf{x} = \mathbf{0}$, using as few keystrokes as possible.
(The first ‘0’ is roman, the second is bold. The superscript ‘T’ is roman.)

Page A171, lines 24–26 (3/13/90)

formula produces a result exactly equivalent to ‘\texttt{\left(\langle subformula\rangle\right)}’, when the \texttt{\langle subformula\rangle} doesn’t end with Punct, except that the delimiters are forced to be of the \texttt{\big} size regardless of the height and depth of the subformula.
line if you insert ‘\noalign\{break\}’ after the \cr for that line. You can prohibit all breaks in an \eqalignno if you set \interdisplaylinepenalty=10000; or you can enclose the whole works in a \vbox:

Page A233, bottom 9 lines, and top three on next page (12/2/89)

The \hss means that the text is normally flush left, and that it can extend to the right of its box. Since \hfill is “more infinite” than \hss in its ability to stretch, it has the effect of right-justifying or centering as stated above. Note that \hfill doesn’t shrink, but \hss does; if the text doesn’t fit in its column, it will stick out at the right. You could cancel the shrinkability of \hss by adding \hfilneg; then an oversize text would produce an overfull box. You could also center some text by putting ‘\hss’ before it and just ‘&’ after it; in that case the text would be allowed to extend to the left and right of its column. The last column of a \+ line (i.e., the column entry that is followed by \cr) is treated differently: The \langle text \rangle is simply put into an hbox with its natural width.

Page A254, line 5 from the bottom (10/5/89)
\vsize hasn’t changed, and if all insertions have been held in place, the same page break reading and expanding this \par token, \TeX will see the \langle vertical command \rangle token again. (The current meaning of the control sequence \par will be used; \par might no longer stand for \TeX’s \par primitive.)

Page A290, lines 12–13 (3/24/90)
simply a single Ord atom without subscripts or superscripts, or an Acc whose nucleus is an Ord, the enclosing braces are effectively removed.

Page A317, line 17 (5/17/90)
\pretolerance=9999 \tolerance=9999 \parindent=0pt

Page A321, lines 16–17 (8/13/90)
18.6. $\bf \bar x^*\{\rm T\}Mx={\rm 0}\iff x=0$. (If you typed a space between \rm and 0, you wasted a keystroke; but don’t feel guilty about it.)

Page A340, nonblank line 11 (3/13/90)
\topglue 1in % This makes an inch of blank space (1in=2.54cm).
\topglue but not \hglue. It does not illustrate \raggedright setting of para-

streams used by \read and \write, to math families used by \fam, to sets of hyphen-
ation rules used by \lang, and to insertions (which require \box, \count, \dimen, and \skip registers all having the same number).

manent value. These macros use registers \count through \count to hold the

number was allocated. The inside story of how allocation is actually performed should be irrelevant when the allocation macros are used at a higher level; you mustn’t assume that plain.tex really does allocation in any particular way.
\count=22 \% this counter allocates \count registers 23, 24, 25, ...

\count19=0 \% this counter allocates language codes 1, 2, 3, ...
\count20=255 \% this counter allocates insertions 254, 253, 252, ...
\countdef\insc@unt=20 \% nickname for the insertion counter
\countdef\allocationnumber=21 \% the most recent allocation
\countdef\m@ne=22 \m@ne=-1 \% a handy constant

\outer\def\newlanguage{\alloc@9\lang\chardef@cclvi}

\def\topglue{\nointerlineskip \vglue-\topskip \vglue} \% for top of page

\noindent{\bf#1.\enspace}{\sl#2\par}\

\if@mid \dimen@=\ht0 \advance\dimen@ by\dp@ \advance\dimen@ by12\p@ \advance\dimen@ by\pagetotal \advance\dimen@ by-\pageshrink

depending on whether or not \t contains an asterisk. (Do you see why?) And here’s
Page A393, lines 3–5 from the bottom (12/3/89)

\hspace{-.17em} plus-3em minus.11em
\vspace{\leaders\copy\dbox\hspace{3.3\wd\dbox plus1fil minus.3\wd\dbox}}

Page A444, line 4 (3/13/90)
Shift box $x$ down by $\frac{1}{2}(h(x) - d(x)) - a$, where $a = \sigma_{22}$, so that the operator character

Page A450, line 8 (12/3/89)

$$0h_0e_0n_5a_0t_0 \; 1n_0a_0 \; 0n_2a_0t_0 \; 1t_0i_0o_0 \; 2i_0o_0 \; 0o_2n_0$$

Page A450, line 14 (12/3/89)

$$0o_2n_0 \; 0o_0n_1c_0 \; 1c_0a_0 \; 1n_0a_0 \; 0n_2a_0t_0 \; 1t_0i_0o_0 \; 2i_0o_0 \; 0o_2n_0$$

and this yields \textquotesingle \textquotesingle_0c_0o_2n_1c_0a_0t_0e_1n_2a_1t_2i_0o_2n_0\textquotesingle \textquotesingle, i.e., \textquotesingle con-cate-na-tion\textquotesingle.

Page A455, last lines before the quotes (11/30/89)
sit yourself (even in restricted horizontal mode) by saying \texttt{\textbackslash setlanguage\{number\}}; this changes the current language but it does not change \texttt{\textbackslash language}. Each what-sit records the current \texttt{\textbackslash lefthyphenmin} and \texttt{\textbackslash righthyphenmin}.

Page A467, right column (12/3/89)

*\textbackslash hfilneg, 72, 100, 233, 283, 285, 290, 397.

Page A468, right column (12/2/89)

\textbackslash interdisplaylinepenalty, 193, 349, 362.

Page A469, left column (12/3/89)

*\textbackslash language (hyphenation method), 273, 346, 455.

Page A469, right column (10/30/89)

*\textbackslash lefthyphenmin, 273, 364, 454, 455.

Page A472, left column (12/3/89)

\textbackslash newlanguage, 346, 347.

Page A476, left column (10/30/89)

*\textbackslash righthyphenmin, 273, 364, 454, 455.
Page A479, new entry (3/13/90)
\topglue, 340, 352.

Page A480, right column (3/13/90)
\vglue, 352, 408.

Page A483, the Providence lines (10/8/89)

[Change the first one to

Providence RI 02940\kern.05em-9506, USA.

Then the second one will be

Providence RI 02940-9506, USA.

The second line will also appear on page C361.]

Page C11, replacement for second quotation at bottom of page (9/27/90)

To anyone who has lived in a modern American city (except Boston)
at least one of the underlying ideas of Descartes’ analytic geometry
will seem ridiculously evident. Yet, as remarked,
it took mathematicians all of two thousand years
to arrive at this simple thing.

— ERIC TEMPLE BELL, Mathematics: Queen and Servant of Science (1951)

Page C220, top line (3/13/90)

modes you get into by hitting ‘S’, ‘R’, or ‘Q’, respectively, in response to error messages

Page C252, line 16 (3/13/90)

for i:=1 upto n_windows: display blankpicture inwindow i; endfor

Page C262, lines 19–21 (11/9/90)

for commonly occurring idioms. For example, ‘stop "hello”’ displays ‘hello’ on the
terminal and waits until ⟨return⟩ is typed.

\defupto = \step1 \until \enddef; \def \downto = \step -1 \until \enddef;

Page C264, lines 4–6 from the bottom (3/24/90)

\vardef \counterclockwise \primary c =
\if \turningcheck>0:
\\ interim \autorounding:=0;
\\ if \turningnumber c <= 0: \reverse fi fi c \enddef;

Page C306, line 6 (3/13/90)

ligtable "": ":" =: oct"042", % close quotes
Page C309, second line from bottom (11/18/89)
\begin{verbatim}
define_whole_vertical_blacker_pixels(vair,slab, ⋱);
\end{verbatim}

Page C315, line 9 from the bottom (1/2/90)
units of printer’s points):

Page C329, line 25 (12/29/90)
which can be used to specify a nonstandard file area or directory name for the gray

Page C337, line 4 from the bottom (1/7/90)
\begin{verbatim}
\def\startfont{\font\testfont=\fontname \spaceskip=0pt
\end{verbatim}

Page C347, left column (9/27/90)
Bell, Eric Temple, 11.

Page C349, left column (9/27/90)
Descartes, René, 6, 11, 19.

Page C356, right column (9/27/90)
[remove the entry for Rex Stout.]

Page C358, right column (9/27/90)
[remove the entry for Nero Wolfe.]

Page Exiii, replacement for last four lines (4/30/90)
- “AMS Euler—A new typeface for mathematics” by Donald E. Knuth
  design project that helps bridge the gulf between mathematics and art.}
- “Meta-Marks: Preliminary studies for a Pandora’s Box of shapes” by
  Neenie Billawala, Stanford Computer Science report 1259 (Stanford, California,
  July 1989), 132 pp. \textit{Lavishly illustrated studies in parameter variation, leading
  to the design of a new typeface called Pandora.}

Page E325, line 13 (3/13/90)
\begin{verbatim}
if 
\text{serifs}: 
\text{
\hspace{1em} \text{if} \ x_{3r} = \max(x_{1r}, \text{hround}(x_1 + .5\text{dot_diam} - .2\text{jut}) - .5\text{tiny}) 
\text{else}: \ x_3 = x_1 - .5 \text{fi};
\end{verbatim}

Page E483, line 4 (3/13/90)
\begin{verbatim}% Character codes '000–'100 and '133–'177 are generated.
\end{verbatim}
Page E544, line 5 (3/13/90)

... (the rest of the program for ‘γ’ in greekl comes here)

Page E557, line 9 (3/13/90)

‘Nevermore—Ah nevermore.’”

Page E558, line 21 (3/13/90)

Clasp a rare and radiant maiden whom the angels name Lenore.”

Page E570, lines 27–28 look better with proper skewchars (3/13/90)

Here’s some bold 10-point math: $\hat{A}_0^\Gamma + \hat{B}_1^\Delta - \check{C}_2^\Theta \times \hat{D}_3^\Lambda / \check{E}_4^\Xi \oplus \hat{F}_5^\Pi \ominus \check{G}_6^\Sigma \otimes \check{H}_7^\Phi \ominus \check{I}_8^\Psi \otimes \check{J}_9^\Omega$. 
This is a list of all corrections made to *Computers & Typesetting*, Volumes A, B, C, and D, between 1 January 1991 and 15 March 1992. Corrections made to the softcover version of *The \TeX\book* are the same as corrections to Volume A. Corrections to the softcover version of *The \Metafont\book* are the same as corrections to Volume C. Some of the corrections below have already been made in reprints of the books. Changes to Volume B refer to the fourth printing (1991), which differs markedly from earlier printings because it includes all the revisions for \TeX3.0. Changes to Volume D refer to the third printing (1991), which differs markedly from earlier printings because it includes all the revisions for \Metafont2.0. Changes to the mini-indexes and master indexes of Volumes B and D are not shown here unless they are not obviously derivable from what has been shown. Dozens of changes, too many to list here, have been made to Volume E because of recent upgrades to the Computer Modern font source files. Those changes, which affect only the digitization at low resolution and the appearance of lowercase delta and some characters in the math symbols fonts (but not the \TFM\ files), are documented at the end of file \texttt{cm85.bug}.

Page A96, lines 9–11 (9/18/91)

Some German words traditionally change their spelling when they are split between lines. For example, ‘backen’ becomes ‘bak-ken’ and ‘Bettuch’ becomes ‘Bett-tuch’. How can you instruct \TeX\ to produce such effects?

Page A178, line 17 (11/19/91)

If you say ‘\texttt{\phantom{⟨subformula⟩}’ in any formula, plain \TeX\ will do its

Page A286, bottom two lines and continuing into A287 (11/21/91)

stands for zero or more (assignment) commands other than \texttt{\setbox}. If the assignments are not followed by a (character), where (character) stands for any of the commands just discussed in the previous paragraph, \TeX\ treats \texttt{\accent} as if it were \texttt{\char}, except that the space factor is set to 1000. Otherwise the character that follows the assignment is accented by the character that corresponds to the (8-bit number). (The purpose of the intervening assignments is to allow the accenter and accentee to be in different fonts.) If the accent must be moved up or down, it is put into an hbox that is raised or lowered. Then the accent is effectively superposed on the character by means of kerns, in such a way that the width of the accent does not influence the width of the resulting horizontal list. Finally, \TeX\ sets \texttt{\spacefactor=1000}.

Page A291, lines 6–8 (11/21/91)

‘\}’ may be followed by optional (assignment) commands other than \texttt{\setbox}, after which ‘\$\$’ must conclude the display. \TeX\ will insert the \texttt{\abovedisplayskip} and \texttt{\belowdisplayskip} glue before and after the result of the alignment.
explained in Appendix G. \TeX{} scans \langle one optional space\rangle after completing a displayed formula; this is usually the implicit space at the end of a line in the input file.

\textbf{12.7.} 1000, except: 999 after 0, B, S, D, and J; 1250 after the comma; 3000 after the exclamation point, the right-quote marks, and the periods. If a period had come just after the B (i.e., if the text had said \textquote{B. Sally}), the space factor after that period would have been 1000, not 3000.

\textbf{14.8.} ba\textlt/ck/en and Be\textlt/tt/u\textlt/ch, where the macros \texttt{\textbackslash{ck}/} and \texttt{\textbackslash{tt}/} are defined by
\begin{verbatim}
def\textbackslash{ck}/\{\discretionary{k-}{k}\{ck}\}
def\textbackslash{tt}/\{tt\discretionary{-}{t}\{}\}
\end{verbatim}

\textbf{Page A354}, line 8
\begin{verbatim}
def\textbackslash{multispan}#1\{\omit\mscount=#1\relax\loop\ifnum\mscount>1 \sp@n\repeat
\end{verbatim}

\textbf{Page A356}, line 11 from the bottom
\begin{verbatim}
\else{\ooalign{\unhbox0\crcr\hidewidth\char'30\hidewidth}}\fi}
\end{verbatim}

\textbf{Page A358}, line 8 from the bottom
\begin{verbatim}
\mathchardef\mapstochar="3237 \def\mapsto{\mapstochar\rightarrow}
\end{verbatim}

\textbf{Page A359}, line 13
\begin{verbatim}
def\textbackslash{overrightarrow}#1\{\vbox{\m@th\ialign{##\crcr
\end{verbatim}

\textbf{Page A359}, line 16
\begin{verbatim}
def\textbackslash{overleftarrow}#1\{\vbox{\m@th\ialign{##\crcr
\end{verbatim}

\textbf{Page A359}, line 19
\begin{verbatim}
def\textbackslash{overbrace}#1\{\mathop{\vbox{\m@th\ialign{##\crcr
\end{verbatim}

\textbf{Page A359}, line 22
\begin{verbatim}
def\textbackslash{underbrace}#1\{\mathop{\vtop{\m@th\ialign{##\crcr
\end{verbatim}
\phantom, \smash, \root, and other operations. (Actually \phantom and \smash are not perfect: They assume that the current style is uncramped.)

Macro \test decides whether or not a given token list register begins with a ⟨space token⟩ as defined in Chapter 24. If so, the macro decides whether the token is explicit and/or funny and/or active.

\newif\ifsparse \newif\iffunny \newif\ifexplicit \newif\ifactive
\def\test#1{\funnyfalse \expandafter\s\the#1! \test}
\def\s{\global\explicitfalse \global\activefalse \futurelet\next\ss}
\def\ss{\ifcat\noexpand\next\stoken\let\next\sss\else\let\next\ns\fi\next}
\def\sx{\spacetrue \ifx\next\stoken\let\next\sss\else\let\next\ssss\fi\next}
\long\def\ssss#1#2{\funnytrue{\escapechar=\if*#1'?\else'*\fi\relax
\if#1\string#1\uccode'#1='~ % we assume that ~ is an active character
\uppercase{\ifcat\noexpand#1\noexpand~\global\activetrue
\else\global\explicittrue\fi\else\testactive#1\fi}}
\long\def\sss#1{\spacefalse}
\long\def\testactive#1#2{\expandafter\tact\string#1\tact}
\long\def\tact#1#2{\def\next{#2}\ifx\next\xs\global\activetrue\fi\def\xs{\s}}
14. If the current item is an Ord atom, go directly to Rule 17 unless all of the following are true: The nucleus is a symbol; the subscript and superscript are both empty; the very next item in the math list is an atom of type Ord, Op, Bin, Rel, Open, Close, or Punct; and the nucleus of the next item is a symbol whose family is the same as the family in the present Ord atom. In such cases the present symbol is marked as a text symbol. If the font information shows a ligature between this symbol and the following one, using the specified family and the current size, then insert the ligature character and continue as specified by the font; in this process, two characters may collapse into a single Ord text symbol, and/or new Ord text characters may appear. If the font information shows a kern between the current symbol and the next, insert a kern item following the current atom. As soon as an Ord atom has been fully processed for ligatures and kerns, go to Rule 17.

Page A446, lines 5 and 6 from the bottom (1/13/92)

are used to change the current style just as in the first pass, so that both passes have the same value of \( C \) when they work on any particular atom.

Page A447, in the parameter usage table (1/13/92)

[Delete the entry for \( \sigma_2 \); the entry for \( \sigma_{17} \) moves down to the bottom of the left column.]

Page A447, line 2 after the parameter usage table (1/13/92)

to parameters in arbitrary families: Rule 17 uses \texttt{fontdimen} parameter 2 (space) to de-

Page A467, entry for \texttt{\hss} (9/18/91)


Page A467, new subentry under hyphenation (9/18/91)

suppressing, 93, 414, 424, 454.

Page A476, right column (11/21/91)


Page B2, line 10 from the bottom (1/11/92)

\texttt{define banner} \equiv \texttt{\verb|\This\TeX\,\TeX\,Version\,3.141|} \{ printed when \TeX\ starts \}

Page B18, lines 21 and 22 (10/12/91)

must have an \texttt{xchr} equivalent in the local character set. (This restriction applies only to preloaded strings, not to those generated dynamically by the user.)
Page B26, new line before fourth line from bottom  

\texttt{nl : integer; \{ new-line character to restore \}}

Page B26, bottom line and top 3 lines of B27  

\begin{verbatim}
else begin if selector > pseudo then
    begin print_char(s); return; \{ internal strings are not expanded \}
    end;
    if ((Character \texttt{s} is the current new-line character 244)) then
    if selector < pseudo then
        begin print_line; return; end;
    nl ← new_line_char; new_line_char ← −1; \{ temporarily disable new-line character \}
    j ← str_start[s];
    while j < str_start[s + 1] do
        begin print_char(so(str_pool[j])); incr(j); end;
    new_line_char ← nl; return;
end;
\end{verbatim}

Page B27, lines 9 and 10  

60. Control sequence names, file names, and strings constructed with \texttt{\string} might contain \texttt{ASCII_code} values that can’t be printed using \texttt{print_char}. Therefore we use \texttt{slow_print} for them:

\begin{verbatim}
var j: pool_pointer; \{ current character code position \}
begin if (s ≥ str_ptr) ∨ (s < 256) then print(s)
else begin j ← str_start[s];
    while j < str_start[s + 1] do
        begin print_char(so(str_pool[j])); incr(j);
        end;
    end;
end;
\end{verbatim}

Page B28, line 8  

\begin{verbatim}
else begin slow_print(format_ident); print_line;
\end{verbatim}

Page B33, line 3  

recursively. A similar interlock is provided by \texttt{set_box_allowed}.

Page B33, new line to come after line 14  

\texttt{set_box_allowed: boolean; \{ is it safe to do a \setbox assignment? \}}

Page B33, new line to come after line 20  

\texttt{set_box_allowed ← true;
Page B36, line 12 (9/19/91)

begin print_nl("You want to edit file"); slow_print(input_stack[base_ptr].name_field);

Page B46, lines 9 and 10 (5/24/91)

arithmetic; see TUGboat 3.1 (March 1982), 10–27. (But the routines cited there must be modified to allow negative glue ratios.)

Page B47, lines 2 and 3 (5/24/91)

structures on a memory_word, which contains either a (signed) integer, possibly scaled, or a (signed) glue_ratio, or a small number of fields that are one half or one quarter of the size used

Page B177, lines 10 and 11 (9/19/91)

begin print_err("Bad mathchar"); help2("A mathchar number must be between 0 and 32767.")

Page B196, new lines after line 11 (1/13/92)

if align_state < 1000000 then {unmatched ‘} aborts the line
begin repeat get_token; until cur_tok = 0;
align_state ← 1000000; goto done;
end;

Page B208, line 21 (9/19/91)

begin slow_print(a); slow_print(n); slow_print(e);

Page B214, line 14 (9/19/91)

begin wlog(banner); slow_print(format_ident); print("\m"); print_int(day); print_char("\m");

Page B214, line 2 from the bottom (9/19/91)

print_char("\m"); incr(open_parens); slow_print(name); update_terminal; state ← new_line;

Page B234, line 22 (9/19/91)

print("\m\n\font\m"); slow_print(font_name[f]); print_char("\m"); end_diagnostic(false);

Page B267, lines 7 and 8 (9/19/91)

print_nl("Output written on\m"); slow_print(output_file_name);
print("\m"); print_int(total_pages); print("\m\page");

Page B296, new lines after line 8 of section 716 (1/11/92)

if f < 0 then
begin decr(n); f ← f + \`200000;
end;
Page B297, new lines after line 7 of section 717

\[
\text{if } f < 0 \text{ then begin de}(n); f \leftarrow f + '200000; end;}
\]

Page B348, bottom two lines

Up to three passes might be made through the paragraph in an attempt to find at least one set of feasible breakpoints. On the first pass, we have threshold = pretolerance and second_pass =

Page B364, line 20

863. The ‘loop’ in the following code is performed at most thrice per call of line_break, since

Page B377, insert new line after line 12

\[
\text{hyf.bchar: halfword; } \{ \text{boundary character after } c_n \} \]

Page B378, line 12 from the bottom

\[
\text{hyf.bchar } \leftarrow \text{character}(s); c \leftarrow qo(hyf.bchar);}
\]

Page B378, line 9 from the bottom

\[
\text{hb } \leftarrow s; \text{ inc}(hn); \text{ hu}[hn] \leftarrow c; \text{ hc}[hn] \leftarrow lc.code(c); \text{ hyf.bchar } \leftarrow \text{non_char};}
\]

Page B378, line 5 from the bottom

\[
\text{else if (type}(s) = \text{kern_node}) \wedge (\text{subtype}(s) = \text{normal}) \text{ then } hb \leftarrow s \\
\text{else goto done3};
\]

Page B379, line 6

\[
\text{j } \leftarrow hn; \text{ q } \leftarrow \text{lig.ptr}(s); \text{ if } q > \text{null then hyf.bchar } \leftarrow \text{character}(q);}
\]

Page B379, new line between lines 14 and 15

\[
\text{if odd(subtype}(s)) \text{ then hyf.bchar } \leftarrow \text{font.bchar}[hf] \text{ else hyf.bchar } \leftarrow \text{non_char};
\]

Page B379, line 19

\[
\text{if } hn < l_hyf + r_hyf \text{ then goto done1}; \{ l_hyf \text{ and } r_hyf \text{ are always } \geq 1 \}
\]

Page B380, lines 9–11 from the bottom reduce to a single line

\[
\text{q } \leftarrow \text{link}(hb); \text{ link}(hb) \leftarrow \text{null}; r \leftarrow \text{link}(ha); \text{ link}(ha) \leftarrow \text{null}; \text{ bchar } \leftarrow \text{hyf.bchar};
\]
Page B436, lines 9 and 10 (3/15/92)

\[ cur_r = \begin{cases} \text{character(lig_stack)}, & \text{if lig_stack > null;} \\ \text{font_bchar[cur_font]}, & \text{otherwise;} \end{cases} \]

except when \( \text{character(lig_stack)} = \text{font_false_bchar[cur_font]} \). Several additional global variables are needed.

Page B438, line 13 from the bottom (3/15/92)

\[ \text{cur_q} \leftarrow \text{tail}; \ \text{cur_l} \leftarrow \text{character(lig_stack)}; \]

Page B507, line 6 of section 1241 (1/11/92)

\begin{align*}
\text{scan_optional_equal}; \\
\text{if } \text{set_box_allowed} & \text{ then } \text{scan_box(box_flag + n)} \text{; enter; } \\
\text{else begin } & \text{print_err("Improper"); print_esc("setbox");} \\
& \text{help2("Sorry, \text{setbox is not allowed after} \text{halign in a display,}"); } \\
& \text{error; end;}
\end{align*}

Page B511, new line inserted after line 3 (1/24/92)

\[ \text{flushable_string: str_number; } \{ \text{string not yet referenced} \} \]

Page B512, new line inserted after line 3 of section 1260 (1/24/92)

\[ \text{flushable_string } \leftarrow \text{str_ptr - 1;} \]

Page B512, the former line 6 of section 1260 (1/24/92)

\begin{align*}
\text{begin if } & \text{cur_name } = \text{flushable_string} \text{ then } \\
\text{begin } & \text{flush_string; cur_name } \leftarrow \text{font_name[f]; end; } \\
\text{if } & s > 0 \text{ then}
\end{align*}

Page B512, line 10 from the bottom (9/19/91)

\[ \text{set_font: begin print("select_font"); slow_print(font_name[chr_code]);} \]

Page B514, line 9 (1/11/92)

\[ \text{set_box_allowed } \leftarrow \text{false; prefixed_command; set_box_allowed } \leftarrow \text{true;} \]

Page B515, line 19 (9/19/91)

\[ \text{slow_print(s); update_terminal;} \]

Page B516, line 2 (9/19/91)

\[ \text{begin print_err(""}; \text{ slow_print(s);} \]
Page B531, lines 19 and 20  (9/19/91)

        print nl("Beginning␣to␣dump␣on␣file␣"); slow_print(w_make_name_string(fmt_file)); flush_string;
        print nl(""); slow_print(format_ident)

Page B533, line 29  (9/19/91)

        begin print nl("Transcript␣written␣on␣"); slow_print(log_name); print_char(".");

Page B538, line 13  (9/19/91)

        10: slow_print(n);

Page B577, left column  (12/23/91)

[Add 798 to the index entries for ‘system dependencies’.

Page C262, line 15  (3/26/91)

        string base_name, base_version; base_name="plain"; base_version="2.7";

Page C271, line 17 from the bottom  (3/26/91)

        currentpen_path shifted (z.t_) withpen penspeck enddef;

Page C347, Bront’e entry  (1/29/91)

[The accent was clobbered; her name should, of course, be Brontë. Fix the entries for Dürer,
Möbius, and Stravinsky in the same way.

Page C348, left column  (1/11/92)

        compound statement, 155, 217.

Page C353, right column  (1/11/92)

        *numeric, 55, 56, 65, 88.

Page C354, miscellaneous entries in both columns  (1/11/92)

        *openwindow, 191–193, 220, 277, 312–313.
        *or, 65, 170, 210, 237, 288–289.
        *pair, 55, 56, 65.
        *path, 55, 56, 171.
        *pen, 55, 56, 65, 170.
        *picture, 55, 56, 114.

Page C356, right column  (1/11/92)

        *string, 55, 56, 69.

Page C357, right column  (1/11/92)

        *transform, 55, 56, 57, 141–143, 160, 266.
define banner ≡ `This is METAfont, Version 2.71`  \{ printed when METAfont starts \}

Then \( \text{eq\textunderscore type}(h(x)) = \text{tag\textunderscore token} \) and \( \text{equiv}(h(x)) = p \), where \( p \) is a two-word value node with errors. Our subroutines also obey the identity \( t[a,b] + t[b,a] = a + b \).
if \( y_{\text{coord}}(s) < y_{\text{coord}}(r) \) then \( y_{\text{coord}}(s) \leftarrow y_{\text{coord}}(r) \)

else if \( y_{\text{coord}}(s) > \text{dest}_y \) then \( y_{\text{coord}}(s) \leftarrow \text{dest}_y \);

if \( x_{\text{coord}}(r) + y_{\text{coord}}(s) > \text{dest}_x + \text{dest}_y \) then \( y_{\text{coord}}(s) \leftarrow \text{dest}_x + \text{dest}_y - x_{\text{coord}}(r) \);

if \( \text{left}_y(s) > y_{\text{coord}}(s) \) then

\[
\begin{align*}
\text{begin} & \quad \text{left}_y(s) \leftarrow y_{\text{coord}}(s); \\
& \quad \text{if } \text{right}_y(r) > y_{\text{coord}}(s) \quad \text{then } \text{right}_y(r) \leftarrow y_{\text{coord}}(s); \\
& \quad \text{end}; \\
\text{end};
\end{align*}
\]

if \( \text{right}_y(s) < y_{\text{coord}}(s) \) then

\[
\begin{align*}
\text{begin} & \quad \text{right}_y(s) \leftarrow y_{\text{coord}}(s); \\
& \quad \text{if } \text{left}_y(q) < y_{\text{coord}}(s) \quad \text{then } \text{left}_y(q) \leftarrow y_{\text{coord}}(s); \\
& \quad \text{end}; \\
\text{end};
\end{align*}
\]

\[
p \leftarrow \text{dep}_\text{list}(p); \quad r \leftarrow \text{inf}_\text{val};
\]

\[
\text{repeat if } \text{value}(\text{info}(p)) \geq \text{value}(r) \text{ then}
\]

The \textit{label}_loc and \textit{label}_char arrays have been set up to record all the starting addresses; we have
This is a list of all corrections made to *Computers & Typesetting* between 15 March 1992 and the publication of the final printed versions of those books. Corrections made to the softcover version of *The \TeXbook* are the same as corrections to Volume A. Corrections to the softcover version of *The METAFONT book* are the same as corrections to Volume C. Changes to Volume B refer to the fourth printing (1991), which differs markedly from earlier printings because it includes all the revisions for \TeX{}3.0. Changes to Volume D refer to the third printing (1991), which differs markedly from earlier printings because it includes all the revisions for METAFONT 2.0. Changes to the mini-indexes and master indexes of Volumes B and D are not shown here unless they are not obviously derivable from what has been shown.

Page A23, line 14

(9/1/92)

a command and you type ‘\texttt{tex}’ or ‘\texttt{run tex}’ or something like that.)

Page A53, line 23

(7/7/92)

\textit{scientiarum imperialis petropolitanæ} became \textit{Akademiïà Nauk SSSR, Doklady}.

Page A146, line 2 from the bottom

(2/25/93)

$|\left\lvert x\right\rvert - |y| \right|$

Page A149, lines 3–5

(2/25/93)

example, we used \texttt{\bigl} and \texttt{\bigr} to produce $|\left\lvert x\right\rvert - |y|\right|$ in one of the previous illustrations; \texttt{\left} and \texttt{\right} don’t make things any bigger than necessary, so ‘$\left\lvert \left\lvert x\right\rvert - |y|\right\rvert\right|$ yields only ‘$|\left\lvert x\right\rvert - |y|\right|$’.

Page A158, line 18 from the bottom

(2/25/93)

are four possibilities for each of these fields. A field can be

Page A282, line 9 from the bottom

(7/8/92)

category 4) are intercepted by the alignment process, en route to \TeX{}’s stomach, so

Page A293, new paragraph after line 15

(4/9/92)

\texttt{\unhbox\langle 8-bit number \rangle}, \texttt{\unhcopy\langle 8-bit number \rangle}. The specified box register must be void. Nothing happens.

Page A309, line 23

(7/7/92)

\textit{petropolitan\ae/\}} became \{\textit{sl Akademi\texttt{\i} a Nauk SSSR, Doklady}\}.

Page A320, line 11

(1/26/93)

17.12. $\left\lvert \bigl(x+f(x)\bigr) \right\rvert \texttt{big/} \left\lvert \bigl(x-f(x)\bigr)\bigr\rvert$. Notice especially the
Page A349, second line from the bottom (7/8/92)
expand to a ⟨number⟩ en route to \TeX’s “stomach”; \multiply wouldn’t work, because

Page A358, bottom line (2/3/93)
it is easy to define \ldots and \cdots macros that give the proper spacing in most

Page A370, lines 28 and 29 (9/1/92)
example, if \TeX is implemented for a purely Cyrillic keyboard, the letter ‘Π’ should be
assigned to code ‘160’ and ‘T’ to code ‘164’, so that ‘ΠT’ still means ‘pt’; or else control

Page A377, lines 17–24 (5/4/92)

\def\sanswitch{\let\n@xt\endsanity \if\next\endsanity
 \else\ifcat\noexpand\next\token\aftergroup\space\let\n@xt=\eat
 \else\ifcat\noexpand\next\egroup\aftergroup{\let\n@xt=\eat
 \else\let\n@xt=\copytok\fi\fi\fi\fi \n@xt}
\def\eat{\afterassignment\sanitize \let\next= }\long\def\copytok#1{\ifcat\noexpand#1\relax\aftergroup\noexpand\fi
 \if\noexpand\next\noexpand\relax\aftergroup\noexpand\fi
 \if\noexpand\next\noexpand~\aftergroup\noexpand\fi

Page A455, line 25 (2/26/93)
rent language” is set equal to \language. Whenever a character is added to the cur-

Page A459, second line of entry for ampersand (3/22/92)

Page A461, right column (2/19/93)
*\chardef, 44, 121, 155, 210, 214, 215, 271,
277, 336, 343, 345, 356, 452.
(\chardef token), 271, 283, 286, 289.

Page A467, left column (2/25/93)
Greek, 127–128, 137, 156, 164, 319,
358, 430, 434.

Page A470, left column (2/25/93)
margins, see \hoffset, \hsize, \narrower.

Page A471, left column (2/19/93)
*\mathchardef, 155, 199, 214, 215, 271,
277, 289, 336, 358, 394.
(mathchardef token), 271, 289.
Page A474, right column (3/22/92)
pound sterling, 54, 339, 428.

Page A477, right column (3/22/92)
sterling, 54, 339, 428.

Page A480, left column (4/9/92)
\*\unhbox, 120, 283, 285, 293, 354, 356, 399.
\*\unhcop y, 120, 283, 285, 293, 353.

Page A481, left column (2/25/93)
whatsits, 95, 110, 157, 226–229, 455.

Page A483, lines 15–21 (2/25/93)
P.O. Box 869
Santa Barbara, CA 93102-0869 USA.

} Don’t delay, write today! That number again is

\texttt{TEX Users Group}
P.O. Box 869
Santa Barbara, CA 93102-0869 USA.

Page B2, line 10 from the bottom (2/27/93)
\begin{verbatim}
define \texttt{banner} \equiv "This is\TeX , Version 3.1415" \{ printed when \TeX \ starts \}
\end{verbatim}

Page B89, line 12 (2/27/93)
In horizontal mode, the \texttt{prev_graf} field is used for initial language data.

Page B89, line 20 (2/27/93)
\begin{verbatim}
pg_field, ml_field: integer; aux_field: memory_word;
[Also delete the definitions of lhmin and rhmin, lines 32 and 33.]
\end{verbatim}

Page B90, line 13 (2/27/93)
\begin{verbatim}
prev_depth \leftarrow ignore_depth; mode_line \leftarrow 0; prev_graf \leftarrow 0;
\end{verbatim}

Page B91, top three lines (2/27/93)
\begin{verbatim}
if \texttt{m = hmode then if nest[p].pg_field \not= `40600000 then}
beg in print("\texttt{language}"); print_int(nest[p].pg_field \texttt{mod `200000});
print(":\texttt{hyphenmin}"); print_int(nest[p].pg_field \texttt{div `20000000}); print_char("\");
print_int((nest[p].pg_field \texttt{div `200000} \texttt{mod `100}); print_char("\")
\end{verbatim}
This code assumes that a glue node and a penalty node occupy the same number of mem words.

Page B344, line 30

\[
\text{link(tail)} \leftarrow \text{new\_param\\_glue(par\_fill\_skip\_code)}; \quad \text{init\_cur\_lang} \leftarrow \text{prev\_graf \ mod } '200000'; \\
\text{init\_l\_hyf} \leftarrow \text{prev\_graf \ div } '20000000'; \quad \text{init\_r\_hyf} \leftarrow (\text{prev\_graf \ div } '20000000) \ \text{mod } '100'; \quad \text{pop\_nest};
\]

Page B353, line 4

Kern nodes do not disappear at a line break unless they are explicit.

Page B353, lines 15 and 16

\[
\text{math\\_node}: \quad \text{break\\_width}[1] \leftarrow \text{break\\_width}[1] - \text{width(s)}; \\
\text{kern\\_node}: \quad \text{if } \text{subtype(s)} \neq \text{explicit} \quad \text{then } \text{goto } \text{done} \\
\text{else} \quad \text{break\\_width}[1] \leftarrow \text{break\\_width}[1] - \text{width(s)};
\]

Page B354, lines 6 and 7

will be the background plus \(l_1\), so the length from \(\text{cur} _p\) to \(\text{cur} _p\) should be \(\gamma + l_0 + l_1 - l\). If the post-break text of the discretionary is empty, a break may also discard \(q\); in that unusual case we subtract the length of \(q\) and any other nodes that will be discarded after the discretionary break.

Page B354, line 18

\[
\text{begin} \quad (\text{Add the width of node } s \text{ to } \text{break\\_width} \ 842); \\
\]

Page B354, line 22

\[
\text{if } \text{post\\_break(}\text{cur} _p) = \text{null then } s \leftarrow \text{link}(v); \quad \{ \text{nodes may be discardable after the break} \}
\]

Page B355, top line

\[
\text{842}. \quad (\text{Add the width of node } s \text{ to } \text{break\\_width} \ 842) \equiv
\]

Page B355, lines 9–14

\[
\text{hlist\\_node, vlist\\_node, rule\\_node, kern\\_node}: \quad \text{break\\_width}[1] \leftarrow \text{break\\_width}[1] + \text{width}(s); \\
\text{othercases } \text{confusion("disc2")} \\
\text{endcases}
\]

Page B364, line 10

a glue node, penalty node, explicit kern node, or math node.

Page B366, line 11 from the bottom

\[
\text{kern\\_node}: \quad \text{if } \text{subtype(}\text{cur} _p) = \text{explicit} \quad \text{then } \text{kern\\_break} \\
\text{else } \text{act\\_width} \leftarrow \text{act\\_width} + \text{width(}\text{cur} _p);
\]
else if precedes_break(prev_p) then try_break(0, unhyphenated)
else if (type(prev_p) = kern_node) ∧ (subtype(prev_p) ≠ explicit) then try_break(0, unhyphenated);

if type(q) = kern_node then
    if subtype(q) ≠ explicit then goto done1;

cur_lang ← init_cur_lang; l_hyf ← init_l_hyf; r_hyf ← init_r_hyf;

cur_lang, init_cur_lang: ASCII_code; { current hyphenation table of interest }
l_hyf, r_hyf, init_l_hyf, init_r_hyf: integer; { limits on fragment sizes }

else if (type(s) = kern_node) ∧ (subtype(s) = normal) then
    begin hb ← s; hyf_bchar ← font_bchar[hf]; end
else goto done3;

var n: 0 .. 64; { length of current word; not always a small_number } j: 0 .. 64; { an index into hc }

var k, l: 0 .. 64; { indices into hc and hyf; not always in small_number range }

push_nest; mode ← hmode; space_factor ← 1000; set_cur_lang; clang ← cur_lang;
prev_graf ← (norm_min(left_hyphen_min) + 100 + norm_min(right_hyphen_min)) * 100000 + cur_lang;

unsave; prev_graf ← prev_graf + 3;
push_nest; mode ← hmode; space_factor ← 1000; set_cur_lang; clang ← cur_lang;
prev_graf ← (norm_min(left_hyphen_min) + 100 + norm_min(right_hyphen_min)) * 200000 + cur_lang;

scaled 1.42(1 + max(−pen_lft, pen_rt, pen_top, −pen_bot))

string base_name, base_version; base_name="plain"; base_version="2.71";
Page C262, line 29 (6/26/93)
def gobble primary g = enddef; def killtext text t = enddef;

Page C271, bottom line (6/26/93)
culldraw p enddef;

Page C272, three new lines for top of page (6/26/93)
def culldraw expr p = addto pic_ doublepath p.t_ withpen currentpen;
cull pic_ dropping(-infinity,0) withweight default_wt_;
addto_currentpicture also pic_; pic_:=nullpicture; killtext enddef;

Page C272, replacement for former line 5 (6/26/93)
(cut_ scaled (1+max(-pen_lft,pen_rt,pen_top,-pen_bot))

Page C296, line 24 (2/3/93)
the definition of \texttt{rp} is changed to ‘\texttt{..tension 4..}’, and if ‘\texttt{scaled 5pt}’ is inserted

Page C299, line 3 (5/15/92)
a Bernsht\'ein polynomial of order \( n - 1 \).)

Page C347, left column (5/15/92)
Bernsht\'ein, Sergei Natanovich, 14.

Page C348, left column (6/26/93)
culldraw, 271, 272.

Page C350, left column (6/26/93)
exponential, see mexp.

Page C352, left column (6/26/93)
killtext, 262, 272.

Page C352, right column (6/26/93)
logarithm, see mlog.

Page C361, lines 14 and 15 (2/25/93)
P.O. Box 869
Santa Barbara, CA 93102-0869 USA.
preprocessor converts these into numeric constants that are 256 or more. This

This file contains one line per string, starting with string number 256, then number 257,

In this case, occurrences of "" in the \texttt{WEB} program will be replaced by 256; occurrences of "This longer string" will be replaced by 257. The symbol @ stands for the numeric

\begin{verbatim}
define banner ≡ ‘This is METAFONT, Version 2.7182’ \quad \{ printed when METAFONT starts \}
\end{verbatim}

if $b > 0$ then

2') Let $Z_{k}^{(j+1)} = \frac{1}{2}(Z_{k}^{(j)} + Z_{k+1}^{(j)})$, for $1 \leq k \leq n - j$, for $1 \leq j < n$.

[Several changes to the code in sections 415, 416, 424, and 425 were made to \texttt{METAFONT} version 2.71 in July 1991, too numerous to mention here. They are documented in file \texttt{mf84.bug} as bug number 560. We also delete lines 4 and 5 of page D194.]

[Delete these spurious lines.]

the meaning of $loc$ should be ‘macro’

if $(loc = k + 1) \land (\text{length}(buffer[k]) = 1)$ then $\text{cur_mod} := buffer[k]$
begin if (max_c[dependent] div 10000 ≥ max_c[proto_dependent]) then t ← dependent

print_int(round_unscaled(internal[year])); print_char(".");

while input_ptr > 0 do
  if token_state then end_token_list else end_file_reading;
while loop_ptr ≠ null do stop_iteration;

loop_ptr ← cond_ptr; cond_ptr ← link(cond_ptr); free_node(loop_ptr, if_node_size);
This is a list of all corrections made to *Computers & Typesetting*, Volume A (also known as *The TeXbook*), between 1992 and the publication of the final printed version of that book in September 1996.

**Page A31, line 8 (3/6/95)**

TeX begins its error messages with ‘!’, and it shows what it was reading at the out for the occasional times when the adjacent characters aa, ae, and o/ should not be

**Page A46, line 8 (1/22/95)**

[The copy on pages 45 and 46 was significantly shortened in the seventeenth printing (October 1989 — see errata.five), and exercise 8.7 moved back to page 48 as a result. But the printer was not asked to change page 49; hence exercise 8.7 appeared twice, on pages 48 and 49, during a six-year period.]

**Page A49, top (9/1/96)**

unadorned \langle box \rangle command, except that the new box being appended to the vertical list is also shifted left or right by the specified amount.

**Page A282, lines 11 and 12 (4/18/96)**

\raise \langle dimen \rangle \langle box \rangle, \lower \langle dimen \rangle \langle box \rangle. This acts just like an unadorned \langle box \rangle command, except that the new box being appended to the horizontal list is also shifted up or down by the specified amount.

**Page A285, lines 15–17 from the bottom (4/18/96)**

\raise \langle dimen \rangle \langle box \rangle, \lower \langle dimen \rangle \langle box \rangle. This acts just like an unadorned \langle box \rangle command, except that the new box being put into the nucleus is also shifted up or down by the specified amount.

**Page A290, lines 4–6 from the bottom (4/18/96)**

\raise \langle dimen \rangle \langle box \rangle, \lower \langle dimen \rangle \langle box \rangle. This acts just like an unadorned \langle box \rangle command, except that the new box being put into the nucleus is also shifted up or down by the specified amount.

**Page A331, bottom two lines (6/25/93)**

if you know that the enclosing box is sufficiently small; and \leaders \vrule \vfill works fine in vertical mode.

**Page A354, lines 19–22 (3/5/95)**

\def\sett@b{\ifx\next+\def\nxt{\afterassignment\s@tt@b\let\nxt}%
\else\let\nxt=\s@tcols\fi
\let\nxt=\relax \nxt} % turn off \outerness
\def\s@tt@b{\let\nxt=\relax \us@false \m@ketabbox}
\def\oalign#1{\leavevmode\vtop{\baselineskip0pt \lineskip25ex
\ialign{##
\crcr##}} \def\oalign{\lineskiplimit=0pt \oalign}
\def\oalign{\lineskiplimit=\maxdimen \oalign} % chars over each other
\def\sh@ft#1{\dimen0=.00#1ex \multiply\dimen0 by\fontdimen1\font
\kern-.0156\dimen0} % compensate for slant in lowered accents
\def\d#1{{\o@lign{\relax#1\crcr\hidewidth\sh@ft{10}.\hidewidth}}}
\def\b#1{{\o@lign{\relax#1\crcr\hidewidth\sh@ft{29}\vbox to.2ex{\hbox{\char'26}\vss}\hidewidth}}}
\def\rightarrowfill{$\m@th \smash- \mkern-7mu
\cleaders\hbox{$\mkern-2mu \smash- \mkern-2mu$}\hfill
\mkern-7mu \mathord\rightarrow$}
\def\leftarrowfill{$\m@th \mathord\leftarrow \mkern-7mu
\cleaders\hbox{$\mkern-2mu \smash- \mkern-2mu$}\hfill
\mkern-7mu \smash-$}$
\setbox0=\hbox{$\braceld$} \bracelu \leaders\vrule height\ht0 depth0pt\hfill\bracerd
\braceld \leaders\vrule height\ht0 depth0pt\hfill\braceru$
\def\downbracefill{$\m@th
\setbox0=\hbox{$\braceld$} \braceld \leaders\vrule height\ht0 depth0pt\hfill\braceru
\braceld \leaders\vrule height\ht0 depth0pt\hfill\bracerd$
[Also delete lines 21 and 22, as the usage is no longer restricted.]
\def\skew#1#2#3{{\muskip0=#1mu \mkern.5\muskip0
\#2\mkern-.5\muskip0{\#3}\mkern.5\muskip0}{}$
\def\overeq#1#2\lower.5pt\vbox{\lineskiplimit\maxdimen \lineskip-.5pt
\def\bmod{\nonscript\mskip-\medmuskip \mkern5mu
\mathbin{\rm mod} \penalty900 \mkern5mu \nonscript\mskip-\medmuskip}
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internet: {\tt http://www.tug.org/}
This is a list of all substantial corrections made to *Computers & Typesetting* from the mid-1990s until the first “Millennium edition” was published at the end of the year 2000. Corrections made to the softcover version of *The TeXbook* are the same as corrections to Volume A. Corrections to the softcover version of *The METAFONT book* are the same as corrections to Volume C. Changes to the mini-indexes and master indexes of Volumes B, D, and E are not shown here unless they are not obviously derivable from what has been shown.

Page A3, line 14 (in certain printings only) (9/6/00)

that looks like ' or ´.

Page A8, lines 14 and 15 (9/6/00)

that is not to be ignored. Notice that \char is a control sequence of the second kind, namely a control symbol, since there is a single nonletter (\,) following

Page A43, line −17 (8/4/98)

into your manuscript, if the b-key on your keyboard is broken. (An optional

Page A88, lines 14, 16, 18, and 21 (8/12/00)

[Insert two blank spaces between 'blank space' and '{}']

Page A96, lines 9 and 10 (8/6/98)

Before 1998, some German words changed their spelling when split between lines. For example, ‘backen’ became ‘bak-ken’ and ‘Bettuch’ sometimes became ‘Bett-

Page A107, line 2 (8/5/98)

usually, you might be tempted to set \tolerance=10000; this allows arbitrarily bad

Page A115, line −19 (8/5/98)

If there’s no room for such an insertion on this page, TeX will insert it at the top of

Page A119, line 15 (8/5/98)

of \dimen, assuming that \dimen is positive.

Page A182, middle line of the displayed commutative diagram (12/3/99)

\[ 0 \rightarrow \mathcal{O}_C \xrightarrow{\pi} \pi_* \mathcal{O}_D \xrightarrow{\delta} R^1 f_* \mathcal{O}_V(-D) \rightarrow 0 \]

Page A233, line −2 (8/5/98)

could avoid this by adding \hskip Opt minus-1fil; then an oversize text would
Page A277, line 1 (8/5/98)

⟨code assignment⟩ −→ ⟨codename⟩ ⟨8-bit number⟩ ⟨equals⟩ ⟨number⟩

Page A277, line −11 (8/5/98)

[Move this line, which defines ⟨at clause⟩, up to the top of the page.]

Page A289, line 24 (2/3/97)

⟨math field⟩ −→ ⟨filler⟩ ⟨math symbol⟩ | ⟨filler⟩ {⟨math mode material⟩}

Page A309, line 3 (8/12/97)

8.4. $3 \times _{11}^{7} 2_{12} \times _{13}^{7} \equiv _{10}^{12} \TeX _{14} b_{11} v_{11} \equiv _{10}^{12}$. The final space comes from the

Page A313, line 24 (9/19/00)

stands for ‘\par\vfill…’, so the next three commands are

Page A313, line 27 (9/19/00)

{vertical mode: \par}

Page A318, lines 12 and 13 (8/5/98)

15.8. \advance\dimen2 by\ifnum\dimen2<0 -\fi.5\dimen3
\divide\dimen2 by\dimen3 \multiply\dimen2 by\dimen3

Page A325, line 22 (12/3/99)

0&\mapright{}&\mathcal{O}_C&\mapright\pi

Page A337, line 3 from the bottom (9/6/00)


Page A348, lines 14–16 (8/6/98)

\def\@if#1{true}{\let#1=\iftrue}\%
\expandafter\expandafter\expandafter\def\@if#1{false}{\let#1=\iffalse}\%

Page A356, line 21 (8/6/98)

\def\AA{\leavevmode\setbox0=\hbox{!}\dimen0=\ht0 \advance\dimen0 by-1ex
between ‘e’ and ‘n’ there are five relevant values in this case (2 from $0h_0e_2n_0$, 0 from $0h_0e_0n_0a_4$, 0 from $0h_0e_0n_5a_0t_0$, 1 from $1n_0a_0$, and 0 from $0n_2a_0t_0$); the maximum of these is 2. The result of all the maximizations is

Page A458, right column

$\uparrow$ and $\downarrow$, 135, 343, 368–369, 429;

al-Khwārizmī, abu ‘Abd Allāh Muḥammad ibn Mūsā, 53.
Page A464, right column (8/6/98)
* \edef, 215–216, 275, 328, 373–374.

Page A466, right column (8/8/98)
\getfactor, 356, 375, 398.

Page A467, right column (8/5/98)
* \hfilneg, 72, 100, 283, 285, 290, 397.

Page A469, left column (8/5/98)
italic type, 13–14, 100, 127, 165, 409, 428, 430.

Page A469–A477, passim (5/13/98)
Add page 272 to the index entries for \lastskip, \pagedepth, \pagefillllstretch, \pagefillllstretch, \pagefillstretch, \pagegoal, \pagesizehrnt, \pagetotal, \parshape, \prevdepth, and \spacefactor.
Also change ‘369’ to ‘370’ in the index entries for \bigrack, \lq, \rbrack, \rq, \sb, and \sp.
Also change ‘Luckombe, Philip’ to ‘Smith, John’.

Page A472, right column (8/6/98)
* \noexpand, 209, 213, 215, 216, 377, 424.

Page A473, left column (8/6/98)
\Orb (◯), 356.

Page Bix, line 16 (1/16/00)
- “Word hy-phen-a-tion by com-put-er” by Franklin Mark Liang, Stan-

Page Bxiv, line 13 (4/19/96)
preprocessor converts these into numeric constants that are 256 or more. This

Page Bxiv, line −1 (4/19/96)
This file contains one line per string, starting with string number 256, then number 257,

Page Bxv, lines 10 and 11 (4/19/96)
In this case, occurrences of " in the WEB program will be replaced by 256; occurrences of "This longer string" will be replaced by 257. The symbol @$ stands for the numeric

Page B2, line −10 (3/8/95)
define banner ≡ ‘This is TeX, Version 3.14159’ { printed when \TeX \ starts }
something in a “muskip” register, or to one of the three parameters \thinspace{\texttt{\textbackslash thinmuskip}}, {\texttt{\textbackslash medmuskip}},

\begin{verbatim}
define non_address = 0 \{ a spurious \texttt{bchar.label} \}
\end{verbatim}

\begin{verbatim}
font_params: array \{internal_font_number\} of font_index; \{ how many font parameters are present \}
\end{verbatim}

\begin{verbatim}
glue_temp: real; \{ glue value before rounding \}
\end{verbatim}

\begin{verbatim}
define billion \equiv float\_constant(1000000000)
define vet\_glue(#) \equiv glue_temp \leftarrow #;
if glue_temp > billion then glue_temp \leftarrow billion
else if glue_temp < \texttt{-billion} then glue_temp \leftarrow \texttt{-billion}
\end{verbatim}

\begin{verbatim}
\langle \text{Move right or output leaders 625} \rangle \equiv
\begin{verbatim}
begin vet\_glue(float(glue\_set(this\_box)) \ast stretch(g));
rule_wd \leftarrow rule_wd + round(glue_temp);
end;
else if shrink\_order(g) = g\_order then
begin vet\_glue(float(glue\_set(this\_box)) \ast shrink(g));
rule_wd \leftarrow rule_wd - round(glue_temp);
\end{verbatim}
\end{verbatim}

\begin{verbatim}
doing\_leaders \leftarrow outer\_doing\_leaders; dvi_v \leftarrow save_v; dvi_h \leftarrow save_h; cur_v \leftarrow base\_line;
\end{verbatim}

\begin{verbatim}
glue_temp: real; \{ glue value before rounding \}
\end{verbatim}

\begin{verbatim}
\begin{verbatim}
begin vet\_glue(float(glue\_set(this\_box)) \ast stretch(g));
rule_ht \leftarrow rule_ht + round(glue_temp);
end;
else if shrink\_order(g) = g\_order then
begin vet\_glue(float(glue\_set(this\_box)) \ast shrink(g));
rule_ht \leftarrow rule_ht - round(glue_temp);
\end{verbatim}
\end{verbatim}
Page B264, line 22 (6/26/93)

\[ \text{doing leaders} \leftarrow \text{outer doing leaders}; \ dvi_v \leftarrow \text{save v}; \ dvi_h \leftarrow \text{save h}; \ cur_h \leftarrow \text{left edge}; \]

Page B297, line 11 (3/7/95)

\[ \text{width}(p) \leftarrow \text{mu mult}(\text{width}(p)); \ \text{subtype}(p) \leftarrow \text{explicit}; \]

Page B309, line 7 (9/22/95)

\[ \text{if cur_style < text_style then} \quad \{ \text{display style} \} \]

Page B356, line −5 (3/4/95)

\[ \text{hang_after} = 1, \ \text{and hang_indent} = 0. \ \text{Note that if hang_indent} = 0, \ \text{the value of hang_after} \]

Page B388, bottom line (3/4/95)

\[ \text{if bchar_label}[hf] \neq \text{non_address} \\text{then} \quad \{ \text{put left boundary at beginning of new line} \} \]

Page B406, line 10 (5/1/98)

\[ q \leftarrow p; \quad \{ \text{now node q represents } p_1 \ldots p_{l-1} \} \]

Page B503, line 12 (3/4/95)

\[ \text{of the following procedure. (Exception: The tabskip glue isn’t trapped while preambles are being scanned.)} \]

Page B529, line 12 (3/4/95)

\[ \text{undump}(0)(\text{fmem_ptr} - 1)(\text{bchar_label}[k]); \]
\[ \text{undump}((\text{min_quarterword})\text{(non_char)}(\text{font_bchar}[k])); \]

Page B531, line 2 (11/23/98)

\[ \text{from appearing again.} \]

Page B531, line 14 (11/23/98)

\[ \text{print_int(year); print_char(" "); print_int(month); print_char(" "); print_int(day);} \]

Page B534, insert new material between lines −16 and −15 (3/20/95)

\[ \text{while input_ptr} > 0 \text{ do} \]
\[ \quad \text{if state} = \text{token_list then end_token_list else end_file_reading;} \]

Page B534, line −2 (3/20/95)

\[ \text{temp_ptr} \leftarrow \text{cond_ptr}; \ \text{cond_ptr} \leftarrow \text{link(cond_ptr); free_node(temp_ptr, if_node_size);} \]
Page B535, line 9 (3/20/95)

\begin{verbatim}
begin init for c ← top_mark_code to split_bot_mark_code do
  if cur_mark[c] ≠ null then delete_token_ref(cur_mark[c]);
  store_fmt_file; return; tini
\end{verbatim}

Page B581, Zabala entry (8/19/00)

Zabala Salelles, Ignacio Andrés: 2.

Page C17, lines 12 and 13 (9/6/00)

\begin{verbatim}
draw z_4\{curl 0\} .. z_2\{z_3 - z_4\} .. \{curl 10\} z_3;
\end{verbatim}

Page C23, line -7 (8/5/98)

\begin{verbatim}
x_1 = ss = w - x_5; \quad y_3 - y_1 = ygap
\end{verbatim}

Page C69, line 17 (9/6/00)

"abra", while \(p_1\) is \((0,0) \ldots (3,3)\) and \(p_2\) is \((0,0) \ldots (3,3) \ldots \text{cycle}\).

Page C94, line -11 (3/4/95)

put are assumed to have square pixels. But if, for example, the \texttt{mode_def} sets

Page C107, line 15 (3/4/95)

\begin{verbatim}
labels(1a, 1b, 2a, 2b, 3a, 3b, 4a, 4b, range 1 thru 36); endchar;
\end{verbatim}

Page C123, lines 21 and 22 (12/19/95)

\begin{itemize}
  \item EXERCISE 14.3
\end{itemize}

\begin{itemize}
  \item Use a \textit{rotated} quarter-circle to produce ‘r’ in font position ‘c’.
\end{itemize}

Page C129, lines 6–17 (8/5/98)

\begin{verbatim}
⟨path primary⟩ → ⟨pair primary⟩ | ⟨path variable⟩
  | ( ⟨path expression⟩ )
  | reverse ⟨path primary⟩
  | subpath ⟨pair expression⟩ of ⟨path primary⟩
⟨path secondary⟩ → ⟨pair secondary⟩ | ⟨path primary⟩
  | ⟨path secondary⟩ ⟨transformer⟩
⟨path tertiary⟩ → ⟨pair tertiary⟩ | ⟨path secondary⟩
⟨path expression⟩ → ⟨pair expression⟩ | ⟨path tertiary⟩
  | ⟨path subexpression⟩ ⟨direction specifier⟩
  | ⟨path subexpression⟩ ⟨path join⟩ cycle
⟨path subexpression⟩ → ⟨path expression⟩
  | ⟨path subexpression⟩ ⟨path join⟩ ⟨path tertiary⟩
\end{verbatim}
of $p$; if $t \leq 0$, precontrol $t$ of $p$ is $z_0$. In particular, if $t$ is an integer, postcontrol $t$ of $p$

[Remove the labels $2r$, $2$, and $21$ below their dots.]

In order to have some transform variables to work with, it’s necessary to ‘hide’

some declarations and commands before giving the next exprs:

Page C147, lines 14, 16, and 19

[Change ‘savepen’ to ‘savepen’.]

FONT’s penrazor stands for ‘makepen ((−.5, 0) -- (.5, 0) -- cycle)’, and pensquare

Page C171, line 19

((path tertiary)) and ((pair tertiary)). A pair expression is not considered to

Page C172, line 14

been evaluated and changed to numeric tokens before being substituted for $s$.

Page C175, line 23

expand into a sequence of tokens. (The language SIMULA67 demonstrated that it is

Path at line 15, before subdivision into octants:

(1.53745,9.05345) controls (1.53745,4.00511) and (5.75409,-0.00049)
..controls (10.85147,-0.00049) controls (16.2217,-0.00049) and (20.46255,4.51297)
..controls (20.46255,9.94655) controls (20.46255,14.99713) and (16.23842,19.00049)
..controls (11.13652,19.00049) controls (5.77066,19.00049) and (1.53745,14.48491)
..cycle

Cycle spec at line 15, after subdivision:

(1.53745,9.05345) % beginning in octant ‘SSE’
..controls (1.53745,6.58786) and (2.54324,4.371)
..(4.16621,2.74803) % segment 0
% entering octant ‘ESE’
..controls (5.8663,1.04794) and (8.24362,-0.00049)
..(10.85147,-0.00049) % segment 0
% entering octant ‘ENE’

... and so on; there are lots more numbers! What does this all mean? Well, the

first segment of the curve, from (1.53745,9.05345) to (10.85147,-0.00049), has been
Cycle spec at line 15, after subdivision and autorounding:
(2,9.05348) \% beginning in octant ‘SSE’
  ..controls (2,6.50526) and (3.02194,4.22272)
  ..(4.6577,2.58696) \% segment 0
% entering octant ‘ESE’
  ..controls (6.2624,0.98225) and (8.45786,0)
  ..(10.85873,0) \% segment 0
% entering octant ‘ENE’

Point (1.53745,9.05345), where there was a vertical tangent, has been rounded to
(2.9,9.05348); point (10.85147,−.00049), where there was a horizontal tangent, has been
rounded to (10.85873,0); the intermediate control points have been adjusted accord-
ingly.  (Rounding of x coordinates has been done separately from y coordinates.)
Finally, with autorounding = 2, additional adjustments are made so that the 45° tran-
sition point will occur at what METAFONT thinks is a good spot:

Cycle spec at line 15, after subdivision and double autorounding:
(2,9.05348) \% beginning in octant ‘SSE’
  ..controls (2,6.6761) and (3.07103,4.42897)
  ..(4.78537,2.71463) \% segment 0
% entering octant ‘ESE’
  ..controls (6.46927,1.03073) and (8.62749,0)
  ..(10.85873,0) \% segment 0
% entering octant ‘ENE’

(Notice that 4.78537 + 2.71463 = 7.50000; when the slope is −1 at a transition point

| (numeric token primary) | (8/5/98) |
Page C210, line −7

| (numeric token primary) | (8/5/98) |
Page C210, line −2

⟨numeric token primary⟩ → ⟨numeric token⟩ / ⟨numeric token⟩

| (numeric token primary not followed by + or − or a numeric token) | (8/5/98) |
Page C211, line 16
Page C213, lines 17–27 (8/5/98)

\[ \langle \text{path primary} \rangle \rightarrow \langle \text{pair primary} \rangle | \langle \text{path variable} \rangle | \langle \text{path argument} \rangle | (\langle \text{path expression} \rangle) | \text{begingroup} (\text{statement list})(\langle \text{path expression} \rangle) \text{endgroup} | \text{makepath} \langle \text{pen primary} \rangle | \text{makepath} \langle \text{future pen primary} \rangle | \text{reverse} \langle \text{path primary} \rangle | \text{subpath} \langle \text{pair expression} \rangle \text{of} \langle \text{path primary} \rangle | \langle \text{path secondary} \rangle | \langle \text{transformer} \rangle | \langle \text{path tertiary} \rangle | \langle \text{path subexpression} \rangle | \langle \text{path join} \rangle \langle \text{path tertiary} \rangle \]

Page C213, line −4 (8/5/98)

\[ \langle \text{path expression} \rangle \rightarrow \langle \text{pair expression} \rangle | \langle \text{path tertiary} \rangle \]

Page C234, line 6 (9/6/00)

line \( z_1 \ldots z_5 \) that bisects \( z_4 \ldots z_2 \), so it starts out in a south-by-southwesterly direction;

Page C246, line 5 of answer 14.15 (8/5/98)

/ length(postcontrol \( t \) of \( p \) − point \( t \) of \( p \)) enddef;

Page C246, line 10 of answer 14.15 (8/5/98)

/ length(precontrol \( t \) of \( p \) − point \( t \) of \( p \)) enddef;

Page C252, line −6 (8/5/98)

\( h + o \) and \( \text{bot} y_4 = −o \), so nothing needs to be done there. We should, however, say

Page C257, large display on line 5 (3/4/95)

\[
\begin{align*}
\text{boolean} & \quad \{ \langle \text{expression} \rangle \}; \\
\text{numeric} & \quad \{ \langle \text{boolean} \rangle \}\{ \langle \text{numeric} \rangle \}; \\
\text{pair} & \quad \{ \langle \text{numeric} \rangle \}\{ \langle \text{pair} \rangle \}; \\
\text{path} & \quad \{ \langle \text{pair} \rangle \}\{ \langle \text{path} \rangle \}; \\
\text{picture} & \quad \{ \langle \text{path} \rangle \}\{ \langle \text{picture} \rangle \}; \\
\text{string} & \quad \{ \langle \text{picture} \rangle \}\{ \langle \text{string} \rangle \}; \\
\text{transform} & \quad \{ \langle \text{string} \rangle \}\{ \langle \text{transform} \rangle \};
\end{align*}
\]

Page C261, line −15 (8/5/98)

- Hacks: gobble, gobbled, killtext; capsule_def; numtok.
Page C286, line 15 (8/5/98)

isn’t entirely expanded by \texttt{expandafter}; only \texttt{METAFONT}'s first step in loop expansion.

Page C299, line 2 (12/6/99)

\[ t[u_1, \ldots, u_n] = \sum_{k=1}^{n} \binom{n-1}{k-1} (1-t)^{n-k} t^{k-1} u_k, \]

Page C299, swap lines 11 and 12 (8/5/98)

\begin{verbatim}
def lbrack = hide(delimiters []) lookahead [ enddef; let [[[ = [; let []] = ]; let [ = lbrack;
\end{verbatim}

Page C306, line 1 (11/4/98)

\begin{verbatim}
ligtable oct"013": "i" =: oct"016", "l" =: oct"017", \% ffi and ffl
\end{verbatim}

Page C311, line 2 (8/5/98)

\[ \text{fine} := 4 - \epsilon, \text{ and } \text{breadth}[1] := 4 - \epsilon. \] (A small amount \(\epsilon\) has been subtracted.

Page C323, line -3 (8/5/98)

statement occurs, the special string \texttt{"title " & \langle title\rangle} is output. (This is how the

Page C332, lines 22–24 (8/5/98)

be replicated so that the final proofs will be \texttt{rep} times bigger than usual, and the pattern will be clipped slightly at the edges so that discrete pixels can be seen plainly.

Page C341, line 23 (10/10/96)

\begin{verbatim}
\def\:\{\setbox0=\hbox{\noboundary\char\n\noboundary}\%
\end{verbatim}

Page C346, left column (9/6/00)

\begin{itemize}
  \item (bounded join), 18–19, 127, 248, 262.
  \item (truncation of displayed context), 44.
\end{itemize}

Page C346, and throughout the index (3/7/95)

(Many index entries for rules of syntax in chapters 25–26 should have been underlined)

Page C350, left column (4/24/00)

Page C351, right column  
(9/22/97)
*intersectiontimes, 136, 178, 213, 265, 294, 298.

Page C353, right column  
(8/5/98)
⟨numeric token atom⟩, delete this entry.
⟨numeric token primary⟩, 72, 210.

Page C354, left column  
(7/26/98)
Orwell, George (= Blair, Eric Arthur), 85.

Page C355, right column  
(3/7/95)
rt, 23, 77, 80, 103, 147, 151, 273.

Page C361, lines 14–15  
(4/29/97)
email: \tt TUG@tug.org
internet: \tt http://www.tug.org/
}

Page C361, bottom five lines  
(4/29/97)
Don’t delay, subscribe today! That address again is
\TeX Users Group
email: TUG@tug.org
internet: http://www.tug.org/
DONALD E. KNUTH, The \TeXbook (1996)

Page Dix, line ix  
(8/19/00)
• “Interfacing with graphic objects” by Ignacio Andrés Zabala Salelles,

Page D71, line 11 of section 178  
(9/13/00)
{ previous mem_end, lo_mem_max, and hi_mem_min }

Page D132, line 6 of section 291  
(9/13/00)
= v_n + w_n \theta_0 - u_n(v_1 + w_1 \theta_0 - u_1(v_2 + \cdots - u_{n-2}(v_{n-1} + w_{n-1} \theta_0 - u_{n-1} \theta_0)\ldots)),

Page D213, line 7  
(9/14/00)
(−y + ϵ, x + y + ϵδ). We should therefore round as if our skewed coordinates were (x + ϵ + ϵδ, y − ϵ)

Page D349, line 4 of section 784  
(9/14/00)
procedure pack_job_name(s : str_number); { s = ".log", ".gf", ".tfm", or base_extension }
Page D451, line 11 (9/14/00)

1040. The value of \texttt{cur\_mod} controls the \textit{verbosity} in the \texttt{print\_exp} routine: If it’s \texttt{show\_code},

Page D464, bottom line (9/14/00)

\texttt{long\_help\_seen}: boolean; \texttt{\{} has the long \texttt{errmessage} help been used? \texttt{\}}

Page D551, Zabala entry (8/19/00)

Zabala Salelles, Ignacio Andrés: 812.

Page E87, bottom line (6/4/98)

— JOHN SMITH, \textit{The Printer’s Grammar} (1755)

Page E95, line 16 (8/8/98)

\texttt{-- z1r -- z1l -- subpath (t, 0) of (z3l\{z9 -- z3\} .. z5r)}

Page E95, line 11 from the bottom (8/8/98)

\texttt{-- z1r -- z1l -- subpath (t, 0) of (z3r\{z9 -- z3\} .. z5r)}

Page E95, line 8 from the bottom (3/6/95)

\texttt{cmchar "Extensible vertical arrow--extension module";}

Page E97, line 8 from the bottom (3/6/95)

\texttt{cmchar "Extensible double vertical arrow--extension module";}

Page E113, line 9 (3/6/95)

\texttt{x5 = .5[x4, x6]; x4 -- x6 = 1.2u; lft x5r = hround(.5w -- .5curve);} 

Page E113, line 10 from the bottom (3/6/95)

\texttt{x5 = .5[x4, x6]; x4 -- x6 = 4.8u; lft x5r = hround(.5w -- .5max\_size);} 

Page E115, line 9 (3/6/95)

\texttt{x5 = .5[x4, x6]; x4 -- x6 = 1.2u; lft x5r = hround(.5w -- .5curve);} 

Page E115, line 12 from the bottom (3/6/95)

\texttt{x5 = .5[x4, x6]; x4 -- x6 = 4.8u; lft x5r = hround(.5w -- .5max\_size);}
Page E147, lines 11–14 from the bottom (7/7/97)
\[ \text{pos} 3(.8[\text{hair, stem}], 0); \text{pos} 4(\text{hair}, -90); \text{pos} 5(\text{hair}, -180); \]
\[ \text{pos} 6(\text{hair}, -270); \text{pos} 7(\text{stem}, -360); \text{pos} 8(\text{vair}, -450); \text{pos} 9(\text{hair}, -540); \]
\[ x_0 = x_1 = x_9; \text{lft} x_{0l} = \text{hround}(1.5u - .5\text{hair}); x_2 = x_4 = x_6 = x_8 = .5w - .25u; \]
\[ \text{rt} x_{3r} = \text{hround}(w - 1.75u); \text{rt} x_{7r} = \text{hround}(w - u); \]

Page E147, line 8 from the bottom (7/7/97)
\[ y_5 = .5[y_4, y_6]; \text{top} y_{6r} - \text{bot} y_{4l} = \text{vstem} + \text{eps}; \text{bot} y_8 = -\infty; y_7 = y_9 = .55[y_6, y_8]; \]

Page E165, line 6 (2/8/97)
\[ y_1 + .5\text{hair} = h; x_1 = x_2 + .75u; \text{pos} 1(\text{hair} + \text{dw}, \text{angle}(2(x_1 - x_2), y_1 - y_2) + 90); \]

Page E165, line 10 (2/8/97)
\[ x_3 = .5[x_2, x_4]; x_7 - .25u = .5[x_6, x_8]; \text{rt} x_{8r} = \text{hround}(w - .5u); \]

Page E187, line 9 (3/6/95)
\[ \text{lft} x_{1l} = \text{lft} x_{2l} = \text{hround}(5w - .5\text{shaved_stem}); \text{top} y_1 = h; \text{bot} y_2 = 0; \]

Page E189, line 8 (3/6/95)
\[ \text{lft} x_{1l} = \text{lft} x_{2l} = \text{hround}(5w - .5\text{shaved_stem}); \text{top} y_1 = h; \text{bot} y_2 = 0; \]

Page E233, line 21 (3/6/95)
\[ \text{path} p; \{\text{interim superness} := \text{more_super}; p = \text{pulled_super_arc}(3, 4)(\text{pull})\}; \]

Page E237, line 5 (8/6/98)
\[ \text{lft} x_1 = \text{hround}.5u; x_2 = w - x_1; y_1 = y_2 = \text{good.y}.7[x\text{.height, asc.height}]; \]

Page E239, line 7 from the bottom (3/6/95)
\[ \text{lft} x_{6r} = \text{hround} u; x_7 = 3u; x_8 = w - 3.5u; \text{rt} x_{9l} = \text{hround}(w - u); \]

Page E253, line 2 from the bottom (8/9/98)
\[ \ldots z_{3e}\{\text{down}\} \ldots \{z_{5l} - z_{4l}\} z_{4e} - z_{5e} - z_{6e}; \quad \% \text{ stroke} \]

Page E263, line 21 (5/10/98)
\[ \text{path} p; \{\text{interim superness} := \text{more_super}; p = \text{pulled_super_arc}(3, 4)(\text{pull})\}; \]

Page E289, line 2 from the bottom (8/9/98)
\[ \ldots z_{3e}\{\text{down}\} \ldots \{z_{5l} - z_{4l}\} z_{4e} - z_{5e} - z_{6e}; \quad \% \text{ stroke} \]
Page E291, line 18 (3/6/95)
\[ x_4 = \frac{1}{3}[x_5, x_{3l}]; \quad z_4 = z_5 + \text{whatever} \times (15u, .1h); \]

Page E297, line 17 (5/10/98)
\[ \text{path} \ p; \ \{\{\text{interim} \superness := \text{more_super}; \ p = \text{pulled_super_arc}_t(3, 4)(\text{pull})\}\}; \]

Page E303, line 17 (5/10/98)
\[ \text{path} \ p; \ \{\{\text{interim} \superness := \text{more_super}; \ p = \text{pulled_super_arc}_t(3, 4)(\text{pull})\}\}; \]

Page E309, line 7 from the bottom (5/8/98)
\[ y_{@0} = y_{@2l} - \text{bracket} - \text{eps}; \]

Page E313, line 7 from the bottom (5/8/98)
\[ y_{@0} = y_{@2l} + \text{bracket} + \text{eps}; \]

Page E319, line 8 (5/11/98)
\[ \text{loop} \top = \text{if serifs}: \text{vround} .77[\text{vair}, \text{fudged.stem}] \text{ else: vair } \text{fi}; \]

Page E373, lines 5 and 6 from the bottom (7/13/97)
\[ \text{numeric} \ aa_-, bb_-, cc_-; \quad bb_- = b/y; \quad cc_- = c/y; \quad aa_- = a \times a - bb_- \times bb_-; \]
\[ (a \times (cc_- + \sqrt{aa_-}) - bb_- \times cc_-)/aa_- \text{ enddef}; \]

Page E423, line 17 (8/8/98)
\[ x_{13} = x_{11} - .5; \quad \text{top} \ y_{14r} = \text{min}(10/7x_{\text{height}} + .5\text{bulb_diam}, h) + 1; \quad \text{top} \ y_{11} = x_{\text{height}}; \]

Page E427, line 21 (8/8/98)
\[ x_{23} = x_{21} - .5; \quad \text{top} \ y_{24r} = \text{min}(10/7x_{\text{height}} + .5\text{bulb_diam}, h) + 1; \quad \text{top} \ y_{21} = x_{\text{height}}; \]

Page E431, lines 18 and 19 (8/8/98)
\[ \text{filldraw} \ z_0 \ - \ -(x_0, y_{2l}) \ - \ -z_{1l}\{\text{right}\}..\{\text{left}\}z_{1r} \]
\[ \quad \text{-- subpath} \ (t, 0) \ \text{of} \ (z_{3r}..\{2(x_0 - x_3), y_0 - y_3\}z_{5r}) \]
Page E431, line 2 from the bottom (8/8/98)

\[ - - z_{1l}\{right \} \ldots \{left \} z_{1r} - - (x_0, y_2) - - cycle; \]
% arrowhead and stem

Page E433, lines 13 and 14 (8/8/98)

\texttt{filldraw} \[ z_0 - - (x_0, y_2l) - - z_{1l}\{left \} \ldots \{right \} z_{1r} \]
\texttt{-- subpath} \((t, 0)\) \texttt{of} \((z_{3l} \ldots \{2(x_0 - x_3), y_0 - y_3\} z_{5r})\)

Page E433, line 2 from the bottom (8/8/98)

\[ - - z_{1l}\{left \} \ldots \{right \} z_{1r} - - (x_0, y_2r) - - cycle; \]
% arrowhead and stem

Page E463, line 15 (8/8/98)

\[ --- z_{1r} \ldots z_{1l} \texttt{--- subpath} (t, 0) \texttt{of} \ (z_{3r}\{z_9 - z_3\} \ldots z_{5r}) \]

Page E463, line 3 from the bottom (8/8/98)

\[ --- z_{1r} \ldots z_{1l} \texttt{--- subpath} (t, 0) \texttt{of} \ (z_{3l}\{z_9 - z_3\} \ldots z_{5r}) \]

Page E465, line 16 (8/8/98)

\[ --- z_{1l} \ldots z_{1r} \texttt{--- subpath} (t, 0) \texttt{of} \ (z_{3r}\{z_9 - z_3\} \ldots z_{5r}) \]

Page E465, line 3 from the bottom (8/8/98)

\[ --- z_{1l} \ldots z_{1r} \texttt{--- subpath} (t, 0) \texttt{of} \ (z_{3l}\{z_9 - z_3\} \ldots z_{5r}) \]

Page E467, line 18 (8/8/98)

\[ --- z_{1l} \ldots z_{1r} \texttt{--- subpath} (t, 0) \texttt{of} \ (z_{3r}\{z_9 - z_3\} \ldots z_{5r}) \]

Page E467, line 3 from the bottom (8/8/98)

\[ --- z_{1l} \ldots z_{1r} \texttt{--- subpath} (t, 0) \texttt{of} \ (z_{13l}\{z_{19} - z_{13}\} \ldots z_{15r}) \]

Page E483, lines 12–14 from the bottom (3/6/95)

\texttt{beginarithchar} (oct "004") \texttt{;} \texttt{pickup} \texttt{fine.nib} \texttt{;} \texttt{pickup} \texttt{rule.nib} \texttt{;}
\texttt{numeric del} \texttt{;} \texttt{del = dot\_size \textbar currentbreadth} \texttt{;} % currentbreadth = fine
\texttt{x}_{3} - \texttt{.5del = good.x(5w \textbar .5del)} \texttt{;} \texttt{center\_on(x_{3})} \texttt{;}
\texttt{y}_{3} + \texttt{.5del = good.y(math\_axis + math\_spread[.5x\_height, \textbar .6x\_height] + .5del)} \texttt{;}

Page E485, bottom line (6/4/98)

— JOHN SMITH, \textit{The Printer's Grammar} (1755)

Page E489, line 4 (8/8/98)

\texttt{lft x}_{6} = \texttt{hround u} \texttt{;} \texttt{x}_{2} = \texttt{w \textbar x}_{6} \texttt{;} \texttt{top y}_{8} = \texttt{h} \texttt{;} \texttt{y}_{8} - \texttt{y}_{4} = \texttt{x}_{2} - \texttt{x}_{6} \texttt{;}

Page E489, line 10 (8/8/98)

\[ lft \ x_6 = \text{hround} \ u; \ x_2 = w - x_6; \ \top \ y_8 = h; \ y_8 - y_4 = x_2 - x_6; \ \text{circle_points}; \]

Page E491, line 3 from the bottom (3/6/95)

\[ \text{spread} := 2\text{ceiling}(\text{spread} \times \text{hppp}/2) + \text{eps}; \ \text{enddef}; \]

Page E507, line 15 (8/8/98)

\[ \text{--- } z_{1r} \ldots z_{1l} \text{--- } \text{subpath} (t, 0) \text{ of } (z_{3r} \{z_9 - z_3\} \ldots z_{5r}) \]

Page E507, line 3 from the bottom (8/8/98)

\[ \text{--- } z_{11r} \ldots z_{11l} \text{--- } \text{subpath} (t, 0) \text{ of } (z_{13r} \{z_{19} - z_{13}\} \ldots z_{15r}) \]

Page E509, line 17 (8/8/98)

\[ \text{--- } z_{1l} \ldots z_{1r} \text{--- } \text{subpath} (t, 0) \text{ of } (z_{3l} \{z_9 - z_3\} \ldots z_{5r}) \]

Page E509, lines 3 and 4 from the bottom (8/8/98)

\[ \text{--- } z_{1l} \ldots z_{1r} \text{--- } \text{subpath} (t, 0) \text{ of } (z_{3l} \{z_9 - z_3\} \ldots z_{5r}) \]

Page E511, line 17 (8/8/98)

\[ \text{--- } z_{1l} \ldots z_{1r} \text{--- } \text{subpath} (t, 0) \text{ of } (z_{3l} \{z_9 - z_3\} \ldots z_{5r}) \]

Page E511, lines 3 and 4 from the bottom (8/8/98)

\[ \text{--- } z_{1l} \ldots z_{1r} \text{--- } \text{subpath} (t, 0) \text{ of } (z_{3l} \{z_9 - z_3\} \ldots z_{5r}) \]

Page E541, bottom line (2/27/97)

\[ \text{labels}(1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15); \ \text{endchar}; \]

Page E568, the example of \texttt{cmtex8} (4/18/96)

(The word ‘logician’ should not be hyphenated.)

Page E574, left column (3/6/95)

\textit{currentbreadth}, 483, 545, 546.

Page E575, right column (9/10/98)

Holmes, Kris Ann, vi, vii.

Page E576, right column (6/4/98)

Delete the entry for Luckombe

Page E579, left column (6/4/98)

Smith, John, 87, 485.
This is a list of all substantial corrections made to *Computers & Typesetting* between the first “Millennium edition” of 2000 and the second such edition, which appeared late in 2001. (More precisely, it lists errors to the 16th, 7th, 6th, 4th, and 5th printings of Volumes A, B, C, D, and E, respectively, that were corrected in the 17th, 8th, 7th, 5th, and 6th printings.) Changes to the mini-indexes and master indexes of Volumes B, D, and E are not shown here unless they are not obviously derivable from what has been shown.

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Page A16, line 7 from the bottom (06/30/01)

Ten-point type is different from *magnified* five-point type.

Page A17, line 7 (06/30/01)

fications that grow in geometric ratios—something like equal-tempered tuning

Page A51, lines 18–20 (06/30/01)

\[ ff \text{ yields } ff; \quad fi \text{ yields } fi; \quad fl \text{ yields } fl; \quad ffi \text{ yields } ffi; \quad ffl \text{ yields } ffl; \quad \text{‘‘ yields } \text{‘‘;} \quad \text{!’ yields } \text{¡;} \quad \text{--- yields } –. \]

Page A52, line 7 from the bottom (06/30/01)

\[ \text{æ, \AE} \quad æ, Æ \quad \text{(Latin ligature and Scandinavian letter AE)} \]

Page A71, line 15 (06/30/01)

One of the interesting things that can happen when glue stretches and

Page A180, line 20 (06/30/01)

Challenge number 5: \[ k = 1.38065 \times 10^{-16} \text{ erg K}^{-1}. \]

Page A254, line 12 from the bottom becomes two lines (04/09/01)

\[
\text{\output}={\unvbox255 \ifnum\outputpenalty<10000 \penalty\outputpenalty\fi}
\]

Page A292, lines 13–16 (06/30/01)

\[ \mathchoice \langle \text{filler}\rangle \{\text{math mode material}\}\{\text{filler}\} \{\text{math mode material}\} \{\text{filler}\} \{\text{math mode material}\} \{\text{filler}\} \{\text{math mode material}\} \{\text{filler}\} \{\text{math mode material}\}. \]

Four math lists, which are defined as in the second alternative of a \{math field\}, are recorded in a “choice item” that is appended to the current list.

Page A306, line 7 (06/30/01)

instead of a shelfful. In fact, the latter idea—to insert an italic correction—is prefer-
18.31. $k=1.38065\times10^{-16}\text{\,erg\,K}^{-1}$.

Connecticut Yankee come out with only nine or ten bad hyphens:


If a suitable starting letter is found, let it be in font $f$. Hyphenation is abandoned unless the \texttt{\hyphenchar} of $f$ is a number between 0 and 255, inclusive. If this test is passed, \TeX{} continues to scan forward until coming to something that’s not one of the following three “admissible items”: (1) a character in font $f$ whose \texttt{lccode} is nonzero; (2) a ligature formed entirely from characters of type (1); (3) an implicit kern. The first inadmissible item terminates this part of the process; the trial word consists of all the letters found in admissible items. Notice that all of these letters are in font $f$.

*\char, 43–45, 76, 86, 155, 283, 286.


orphans, see widow words.

statements will be meaningful. We insert the label ‘exit’ just before the ‘end’ of a procedure in

begin update_terminal; { now the user sees the prompt for sure }

ignore = 9 \{ characters to ignore ( ^^@ ) \}
active_char = 13 \{ characters that invoke macros ( ^ ) \}

or unset nodes; in particular, each mlist item appears in the variable-size part of \texttt{mem}, so the \texttt{type} field is always present.
between ‘fl’ and ‘y’, then $m = 2$, $t = 2$, and $y_1$ will be a ligature node for ‘fl’ followed by an

$q_i(2), q_i(6)$: \textbf{begin} $\text{cur}_r \leftarrow \text{rem}_\text{byte}(q); \{ |=:; |=:\}$

\textbf{end}; \{ now we are in vertical mode, working on the list that will contain the display \}

slightly. If $\text{autorounding} > 1$, you get even more changes: Paths are perturbed slightly

tance is $\text{length}(z_4 - z_1)$. But there’s a slicker solution: Just calculate

$\text{abs ypart}((z_1 - z_2) \text{rotated } -\text{angle}(z_3 - z_2))$.

— LA ROCHEFOUCAULD, \textit{Maximes} (1665)

La Rochefoucauld, François VI, 313.

*true, 55, 64–65, 170, 210.

statements will be meaningful. We insert the label ‘\textit{exit}’ just before the ‘\textbf{end}’ of a procedure in

\textbf{begin} update\_terminal; \{ now the user sees the prompt for sure \}

define $\text{subscr\_head\_loc}(\#) \equiv \# + 1 \{ \text{where } \text{value, subscr\_head, and attr\_head are} \}$

$(y, -x)$ will appear in node $p$. Similarly, a fourth-octant transformation will have been applied after the transition, so we will have $x\_\text{coord}(q) = -x$ and $y\_\text{coord}(q) = y$. 
where $x'(t) \geq 0$ we have right_type = first_octant or right_type = eighth_octant; in regions where $x'(t) \leq 0$, we have right_type = fifth_octant or right_type = fourth_octant.

from appearing again.
This is a list of all substantial corrections made to *Computers & Typesetting* since the publication of the second “Millennium Edition” at the close of the year 2001. (More precisely, it lists errors corrected since the 16th printing of Volume A, the 7th printing of Volume B, the 6th printing of Volume C, the 4th printing of Volume D, and the 5th printing of Volume E.) Corrections made to the softcover version of *The \TeX\book*, beginning with its 32nd printing, are the same as corrections to Volume A. Corrections to the softcover version of *The METAFONTbook*, beginning with its 11th printing, are the same as corrections to Volume C. Changes to the mini-indexes and master indexes of Volumes B, D, and E are not shown here unless they are not obviously derivable from what has been shown. Some (or all) of these errors have been corrected in the most recent printings.

Page A7, line 4 from the bottom (01/15/04)

since control sequences of the second kind always have exactly one symbol after

Page A123, line 7 from the bottom (02/27/08)

that it won’t make the natural height-plus-depth of \texttt{\box\textit{n}} surpass \texttt{\dimen\textit{n}}, when it is

Page A124, lines 12 and 13 (02/27/08)

means that \TeX\ has tried to split an \texttt{\insert}254 to height 180.2 pt; the natural height-

Page A153, line 7 (01/03/14)

of three fonts: one for text size, one for script size, and one for scriptscript size. The

Page A206, lines 12–17 (05/21/07)

or alignment template is also considered to be \texttt{\outer} in this sense; for example, a file

Page A216, line 3 from the bottom (12/20/07)

\texttt{\openin\langle\textit{number}\rangle=\langle\textit{file name}\rangle}

Page A290, lines 25–26 (02/24/08)

- \texttt{\langle\textit{leaders}\rangle\langle\texttt{box or rule}\rangle\langle\textit{horizontal skip}\rangle}. Here \texttt{\langle\textit{horizontal skip}\rangle} refers to one of the first five glue-appending commands just mentioned; the formal syntax for \texttt{\langle\textit{leaders}\rangle}

Page A292, line 15 (12/02/02)

are defined as in the second alternative of a \texttt{\langle\textit{math field}\rangle}, are recorded in a “choice
Page A308, lines 25 and 26
(06/17/02)
\def\appendroman#1#2#3{\expandafter\def\expandafter{\csname\expandafter\gobble\string#2\romannumeral#3\endcsname}}

Page A311, line 14
(12/02/02)
\def\{%\if\space\next\ % assume that \next is unexpandable

Page A311, line 17
(12/29/07)
\leavevmode\copy0\kern-\wd0\makelightbox}

Page A318, lines 24 and 25
(10/01/03)
15.13. Yes, in severe circumstances. (1) Previous footnotes might have left no room for any more footnotes on the page. (2) If \vadjust{\eject} occurs on the same line

Page A364, lines 12–15 from the bottom
(02/29/08)
\def\loggingall\tracingcommands=2 \tracingstats=2 \tracingpages=1 \tracingoutput=1 \tracinglostchars=1 \tracingmacros=2 \tracingparagraphs=1 \tracingrestores=1 \showboxbreadth=\maxdimen \showboxdepth=\maxdimen \tracingall=\tracingonline=1 \loggingall

Page A364, line 5 from the bottom
(02/29/08)
\def\fmtversion{3.141592653} % identifies the current format

Page A373, lines 4 and 5 from the bottom
(01/02/14)
And here’s another solution (which may be faster, because token list registers can be expanded more quickly than macros on some implementations, using \the):

Page A373, line 2 from the bottom
(01/02/14)
\loop \ifnum\m>0 \t=\expandafter{\the\t}\advance\m-1 \repeat
Finally, the reformatting of \footins can be achieved easily with an elegant technique suggested by David Kastrup, using the following \TeX code within the \output routine:

\def\makefootnoteparagraph{\unvbox\footins \baselineskip=\footnotebaselineskip \removehboxes}
\def\removehboxes{\unskip\setbox0=\lastbox \ifhbox0{\removehboxes}\unhbox0 \else\noindent \fi}

The key idea here is \removehboxes, a macro that has the magical ability to take a vertical box such as \vbox{\box1\box2\box3\removehboxes} and transform it into \vbox{\noindent\unhbox1\unhbox2\unhbox3}, if \box1, \box2, and \box3 are hboxes. Notice how \removehboxes introduces braces so that \TeX’s save stack will hold all of the hboxes before they are unboxed. Each level of recursion in this routine uses one cell of input stack space and three cells of save stack space; thus, it is generally safe to do more than 100 footnotes without exceeding \TeX’s capacity.

In our application there is no interline glue within \footins, so the \unskip command could be deleted from \removehboxes.

Incidentally, the \unskip and \lastbox operations have running times of the approximate form $a + mb$, where $m$ is the number of items efficiency on the list preceding the glue or box that is removed. Hence \removehboxes has a running time of order $n^2$ when it removes $n$ boxes. But the constant $b$ is so small that for practical purposes it’s possible to think of \unskip and \lastbox as almost instantaneous.
Page A450, lines 14–16 from the bottom (12/19/02)

\[ s_{1}tic \exp x_{3}p \pi_{a_{1}a_{2}a_{1}d_{1}o_{1}c_{2}o_{2}u_{2}u_{2}s_{0}} \]

(where subscripts that aren’t shown are zero), and this yields

\[ .0s_{0}u_{1}p_{0}e_{0}r_{c_{0}a_{0}l_{0}i_{0}f_{0}a_{0}g_{1}i_{0}l_{1}d_{1}i_{0}c_{1}e_{0}x_{3}p_{2}i_{3}a_{0}l_{2}i_{1}d_{0}o_{1}c_{2}o_{2}u_{2}s_{0} . \]

Page A458, left column (01/11/07)

\[ \\, 38, \, 356, \, 378, \, 418. \]

Page A459, left column (03/17/06)

angle brackets ( ⟨ ⟩), 59, 146–147, 150, 156, 268, 420, 437; see also \langle \rangle.

Page A461, left column (02/24/08)

\texttt{\textbackslash boxit}, 223, 331.

Page A468, right column (02/26/08)

interline glue, 78–79, 80, 104, 105, 125, 221, 245, 263, 281–282, 335, 352, 399, 409.

Page A469, left column (02/26/08)

Kastrup, David Friedrich, 399.

Page A470, left column (01/21/03)

\texttt{\textbackslashloggingall}, 364.

Page A477, right column (06/08/07)


Page A479, right column (09/11/07)

\texttt{\textbackslash undefined}, 350, 384.

Page A483, line 5 from the bottom (11/18/03)

— HIERONYMUS HORNSCHUCH, όΡθοτυπογράφω (1608)

Page Bv, page number change (12/27/11)

[For consistency with Volumes A, C, and E, the preface now begins on page v instead of page vii. This change was first made in the ninth printing.]

Page Bv (formerly Bvii), bottom two lines (01/06/14)

all of those changes. I now believe that the final bug was discovered on 14 September 2008 and removed in version 3.14159265. The finder’s fee has converged to $327.68.
Format specs have no effect on the corresponding Pascal program, but they do influence

\begin{verbatim}
define banner \= 'This is TeX, Version 3.14159265' \{ printed when \TeX{} starts \}
\end{verbatim}

Incidentally, Pascal’s standard \textit{round} function can be problematical, because it disagrees with the IEEE floating-point standard. Many implementors have therefore chosen to substitute their own home-grown rounding procedure.

\begin{verbatim}
[
'\textasciitilde{41} .. \textasciitilde{46}, \textasciitilde{60} .. \textasciitilde{71}, \textasciitilde{136}, \textasciitilde{141} .. \textasciitilde{146}, \textasciitilde{160} .. \textasciitilde{171}]
\end{verbatim}

must be printable. Thus, at least 81 printable characters are needed.

\begin{verbatim}
begin print_esc("csname"); print_esc("endcsname"); print_char(" "); end
\end{verbatim}

\begin{verbatim}
define save_index(#) \= save_stack[#].hh.rh \{ eqtb location or token or save_stack location \}
\end{verbatim}

\begin{verbatim}
begin while (state = token_list) \& (loc = null) \& (token_type \neq v.template) do
end_token_list; \{ conserve stack space \}
\end{verbatim}

\begin{verbatim}
cat: 0 .. max_char_code; \{ cat_code(cur_char), usually \}
\end{verbatim}

In fact, these three procedures account for almost every use of \textit{get_next}.
else if \( m = \text{vmode} \) then scanned_result\((\text{prev\_depth})(\text{dimen\_val})\)
else scanned_result\((\text{space\_factor})(\text{int\_val})\)

\[
\text{cur\_val} \leftarrow 0; \quad \text{cur\_val\_level} \leftarrow \text{int\_val}; \quad \text{radix} \leftarrow 0; \quad \text{cur\_order} \leftarrow \text{normal};
\]

and denominator sum to 32768 or less. According to the definitions here, 2660 dd \( \approx 1000.33297 \) mm;

used input files like \texttt{webmac.tex}.

The following procedures don’t allow spaces to be part of file names; but some users seem to like names that are spaced-out. System-dependent changes to allow such things should probably be made with reluctance, and only when an entire file name that includes spaces is “quoted” somehow.

\[
\text{if } (\text{nw} = 0) \lor (\text{nh} = 0) \lor (\text{nd} = 0) \lor (\text{ni} = 0) \text{ then abort;}
\]

\[
\text{begin } \text{cur\_glue} \leftarrow \text{real}; \quad \{ \text{glue seen so far} \}
\]
\[
\text{cur\_g} \leftarrow \text{scaled}; \quad \{ \text{rounded equivalent of } \text{cur\_glue} \text{ times the glue ratio} \}
\]

\[
\text{begin } \text{cur\_g} \leftarrow 0; \quad \text{cur\_glue} \leftarrow \text{float\_constant}(0);
\]
\[
\text{this\_box} \leftarrow \text{temp\_ptr}; \quad \text{g\_order} \leftarrow \text{glue\_order}(\text{this\_box}); \quad \text{g\_sign} \leftarrow \text{glue\_sign}(\text{this\_box});
\]

\[
\text{begin } g \leftarrow \text{glue\_ptr}(p); \quad \text{rule\_wd} \leftarrow \text{width}(g) - \text{cur\_g};
\]

\[
\text{begin } \text{cur\_glue} \leftarrow \text{cur\_glue} + \text{stretch}(g); \quad \text{vet\_glue} (\text{float}(\text{glue\_set}(\text{this\_box})) \ast \text{cur\_glue});
\]
\[
\text{cur\_g} \leftarrow \text{round}(\text{glue\_temp});
\]

\[
\text{begin } \text{cur\_glue} \leftarrow \text{cur\_glue} - \text{shrink}(g); \quad \text{vet\_glue} (\text{float}(\text{glue\_set}(\text{this\_box})) \ast \text{cur\_glue});
\]
\[
\text{cur\_g} \leftarrow \text{round}(\text{glue\_temp});
\]

\[
\text{rule\_wd} \leftarrow \text{rule\_wd} + \text{cur\_g};
\]
else begin lx ← lr \div (lq + 1);

\begin{verbatim}
cur_glue: real; \{ glue seen so far\}
cur_g: scaled; \{ rounded equivalent of \textit{cur\_glue} times the glue ratio\}
\begin{verbatim}
begin cur_g ← 0; cur_glue ← float_constant(0);
this_box ← temp_ptr; g_order ← glue_order(this_box); g_sign ← glue_sign(this_box);
\end{verbatim}
\end{verbatim}

\begin{verbatim}
begin g ← glue_ptr(p); rule_ht ← width(g) − cur_g;
\end{verbatim}

\begin{verbatim}
begin cur_glue ← cur_glue + stretch(g); vet_glue(float(glue_set(this_box)) \ast cur_glue);
cur_g ← round(glue_temp);
\end{verbatim}

\begin{verbatim}
begin cur_glue ← cur_glue − shrink(g); vet_glue(float(glue_set(this_box)) \ast cur_glue);
cur_g ← round(glue_temp);
\end{verbatim}

\begin{verbatim}
rule_ht ← rule_ht + cur_g;
\end{verbatim}

else begin lx ← lr \div (lq + 1);

\begin{verbatim}
total_pages \geq 65536, the DVI file will lie. And if \textit{max\_push} \geq 65536, the user deserves whatever chaos might ensue.
\end{verbatim}

\begin{verbatim}
p: pointer; \{ a new glue node\}
\end{verbatim}

left_noad: begin print_esc("left"); print_delimiter(delimiter(p));
\end{verbatim}

right_noad: begin print_esc("right"); print_delimiter(delimiter(p));

begin if s = text_size then print_esc("textfont");
Page B299, line 9 (12/20/02)

\[
\text{if } \text{type}(r) = \text{kern\_node} \text{ then } \{ \text{unneeded italic correction} \}
\]

Page B332, line 6 (12/19/02)

is being scanned, or when no alignment preamble is active.

Page B332, line 8 (12/19/02)

\[
\text{begin if } (\text{scanner\_status} = \text{aligning}) \lor (\text{cur\_align} = \text{null}) \text{ then}
\]

Page B336, line 11 from the bottom (10/13/03)

\[j - i + \text{min\_quarterword}\] in their link fields. The values of \(w_{ii}\) were initialized to null_flag,

Page B342, lines 5 and 6 (09/11/07)

In restricted horizontal mode, the clang part of aux is undefined; an over-cautious Pascal runtime system may complain about this.

Page B416, line 22 (02/29/08)

\[
\text{if } \text{count}(t) = 1000 \text{ then } t \leftarrow \text{height}(r) \\
\text{else } t \leftarrow x\_over\_n(\text{height}(r), 1000) * \text{count}(t); \\
\text{print\_scaled}(t)
\]

Page B438, lines 1–3 (09/11/07)

1035. If \text{link}(\text{cur\_q})\ is nonnull when wrapup is invoked, \text{cur\_q} points to the list of characters that were consumed while building the ligature character \text{cur\_l}.

Page B438, lines 19 and 20 (09/11/07)

\[
\text{begin if } \text{link}(\text{cur\_q}) > \text{null} \text{ then} \\
\quad \text{if } \text{character}(\text{tail}) = q_i(\text{hyphen\_char}[\text{main\_f}]) \text{ then } \text{ins\_disc} \leftarrow \text{true};
\]

Page B438, line 4 from the bottom (09/11/07)

\[
\text{link}(\text{tail}) \leftarrow \text{lig\_stack}; \text{tail} \leftarrow \text{lig\_stack} \{ \text{main\_loop\_lookahead is next} \}
\]

Page B439, line 3 (09/11/07)

\[
\text{if } \text{main\_p} > \text{null} \text{ then } \text{tail\_append}(\text{main\_p}); \{ \text{append a single character} \}
\]

Page B440, new line to follow line 9 (09/11/07)

\[
\text{if } \text{cur\_r} = \text{non\_char} \text{ then } \text{goto main\_loop\_wrapup};
\]

Page B452, line 18 (28/03/11)

\text{hmode}, where the latter two are used to denote \text{\vbox} and \text{\hbox}, respectively.
if \((\text{cur\_cmd} = \text{hskip}) \land (\text{abs}(\text{mode}) \neq \text{vmode})) \lor ((\text{cur\_cmd} = \text{vskip}) \land (\text{abs}(\text{mode}) = \text{vmode}))\) then

Page B472, new paragraph to follow line 10

A devious user might force an \textit{endv} command to occur just about anywhere; we must defeat such hacks.

Page B472, replacement for what used to be line 13

\begin{verbatim}
begin base_ptr ← input_ptr; input_stack[base_ptr] ← cur_input;
while (input_stack[base_ptr].index_field ≠ \textit{v\_template}) \\
\land (input_stack[base_ptr].loc_field = \text{null}) \\
\land (input_stack[base_ptr].state_field = \text{token\_list}) do decr(base_ptr);
if (input_stack[base_ptr].index_field ≠ \textit{v\_template}) \\
\lor (input_stack[base_ptr].loc_field ≠ \text{null}) \\
\lor (input_stack[base_ptr].state_field ≠ \text{token\_list}) then
fatal_error(\textquoteright\text{(interwoven alignment\_preambles\_are\_not\_allowed)}\textquoteright);
if \text{cur\_group} = \text{align\_group} then
\end{verbatim}

Page B505, line 19

\begin{verbatim}
("since\_the\_result\_is\_out\_of\_range.");
if \(p ≥ \text{glue\_val}\) then delete\_glue\_ref(cur\_val);
error; return;
\end{verbatim}

Page B506, line 1

1237. Here we use the fact that the consecutive codes \textit{int\_val} .. \textit{mu\_val} and \textit{assign\_int} ..

Page B520, line 8

says, for example, \texttt{(preloaded\_format=plain\ 1982.11.19)}, showing the year, month, and day

Page B535, new line to follow line 11

\begin{verbatim}
if \text{last\_glue} ≠ \text{max\_halfword} then delete\_glue\_ref(last\_glue);
\end{verbatim}

Page B578, new entry

Trabb Pardo, Luis Isidoro, 2.

Page Cxi, line 4

27 Recovery from Errors . . . . . . . . . . . . . . . . . . . . 223

Page C11, line 11

the area below the bar to the area above it equal to \((\sqrt{5} + 1)/2 \approx 1.61803\), the
Page C29, illustration for exercise 4.11 (09/09/01)
[points 2 and 5 should not be labeled twice]

Page C32, line 5 from the bottom (01/04/14)

\hfill 20 \quad \text{penpos1(stem,15); penpos2(.9stem,12); penpos3(stem,10);}

Page C36, line 5 from the bottom (01/05/14)
line 12, where it says ‘x11’, not ‘x11’ or ‘x\text{11}’); be sure to distinguish between

Page C55, lines 5 and 6 (01/05/14)
suffixed or subscripted. Thus, the syntax rule for ⟨variable⟩ should actually be replaced
by a slightly more complicated pair of rules:

Page C129, line 16 (02/21/08)

⟨path subexpression⟩ → ⟨path expression not ending with direction specifier⟩

Page C130, lines 13–15 from the bottom (09/13/03)
point but not after it, the nonempty one is duplicated in a similar way. A basic path
join ‘.. controls u and v ..’ specifies explicit control points that override any direction
specifiers that may immediately surround it.

Page C137, lines 5–7 from the bottom (02/21/08)

\(\Rightarrow\) Let’s conclude this chapter by applying what we’ve learned about paths to a
real-life example. The Journal of Algorithms was published for many years
by Academic Press, and its cover page carried the following logo, which was designed

Page C137, bottom two lines (02/21/08)
A METAfont program to produce this logo made it possible for the editors of the journal to use it on letterheads in their correspondence. Here is one way to do that job,

Page C156, line 15 from the bottom (09/09/01)
be the values they had upon entry to the group.)

Page C159, lines 12–15 (12/01/06)

\texttt{def \--- = \ldots tension infinity \ldots enddef;}

it makes ‘\(z_1 \ldots z_2\)’ become ‘\(z_1 \ldots \text{tension infinity} \ldots z_2\)’. The replacement text
can be any sequence of tokens not including ‘\texttt{enddef}’; or it can include entire
subdefinitions like ‘\texttt{def} \ldots \texttt{enddef}’, according to certain rules that we shall
explain later.
Page C171, line 16 from the bottom (06/18/02)

\[\langle\text{loop}\rangle \rightarrow \langle\text{loop header}\rangle: \langle\text{loop text}\rangle \text{ \textbf{endfor}}\]

Page C179, line 7 from the bottom (09/09/01)

next time \texttt{META}FONT gets to the end of an input line, it will stop reading from the

Page C180, lines 14–16 (04/25/03)

digits should be a file name that works in essentially the same way on all installations of \texttt{META}FONT. Uppercase letters are considered to be distinct from their lowercase counterparts, on many systems.

Page C180, new line to be inserted 4 from the bottom (06/25/04)

- When \texttt{META}FONT is reading the symbolic tokens to be saved by \texttt{save}.

Page C203, line 12 from the bottom (04/25/03)

point 3 at the right of the triangle might digitize into a

Page C213, line 26 (02/21/08)

\[\langle\text{path subexpression}\rangle \rightarrow \langle\text{path expression not ending with direction specifier}\rangle\]

Page C226, line 23 (02/21/08)

following nineteen things will be mentioned:

Page C226, new line to be second from the bottom (02/21/08)

\textbf{independent variables} (distinct numeric variables)

Page C236, line 7 from the bottom (01/05/14)

\textbf{7.4.} False. After ‘\texttt{newinternal x;}’ you can’t say ‘x\langle\text{tag}\rangle’ in a \langle\text{suffix list}\rangle.

Page C246, line 12 (02/21/08)

is performed whenever \texttt{META}FONT uses the last two alternatives in the definition

Page C250, lines 13 and 14 (02/19/08)

\textbf{19.3.} Yes, if and only if \(n - \frac{1}{2}\) is a nonnegative even integer. (Because ambiguous values are rounded upwards.)

Page C250, line 12 from the bottom (04/25/03)

following \langle\text{boolean primary}\rangle.)
problem; it would simply have put `ENDFOR` into the replacement text of `asts`, because

```latex
if if pair x: x>(0,0) else: false fi: A else: B fi.
```

be known by saying ‘if known \( p - q: p = q \) else: false fi’; transforms could be handled

given angle \( \phi \). We can consider the common angle \( \theta \) of \( z_{1r} - z_{1l} \) and \( z_{0r} - z_{0l} \) to be

‘b’ was shipped out.) The second letter, ‘o’, is placed in a second little box adjacent

— CAROLUS LINNÆUS, *Philosophia Botanica* (1751)

(\(\text{The proofsheet resolution will be 50 pixels per inch, because cheapo has 200 pixels per}\)))


*angle, 29, 67, 72, 107, 135, 211, 238.

arccosine, arcsine, arctangent, see angle.

independent variables, 81–83, 88, 224, 226.

Linné, Carl von (= Linnaeus, Carolus), 325.

*save, 155–156, 160, 173, 178, 180, 218, 236, 244, 296, 299.
Page Dv, page number change (12/27/11)

[For consistency with Volumes A, C, and E, the preface now begins on page v instead of page vii. This change was first made in the sixth printing.]

Page Dv (formerly Dvii), bottom two lines (01/06/14)

corporates all of those changes. I now believe that the final bug was discovered on 03 June 2008, and removed in version 2.7182818. The finder’s fee has converged to $327.68.

Page Dxiii (formerly Dxv), line −7 (12/27/11)

Format specs have no effect on the corresponding Pascal program, but they do influence

Page D2, line −17 (01/03/14)

define banner ≡ ´This is METAFONT, Version 2.7182818´ { printed when METAFONT starts }

Page D2, lines 4 and 5 from the bottom (12/23/02)

types; there are no ‘var’ parameters, except in the case of files or in the system-dependent paint_row procedure; there are no tag fields on variant records; there are no real variables; no procedures are declared local to other procedures.)

Page D16, new paragraph to follow line 26 (06/25/04)

The first line is special also because it may be read before METAFONT has input a base file. In such cases, normal error messages cannot yet be given. The following code uses concepts that will be explained later. (If the Pascal compiler does not support non-local goto, the statement ‘goto final_end’ should be replaced by something that quietly terminates the program.)

Page D22, line 26 (09/11/07)

ASCII codes [´60 .. ´71, ´136 .. ´146] must be printable.

Page D31, line 29 (06/25/04)

This is the only nontrivial goto statement in the whole program. It is used when there is no

Page D42, replacement for lines 8–13 (12/23/02)

Notice that if 64-bit integer arithmetic were available, we could simply compute \((2^{29} \times p + q) \text{ div } (2 \times q)\). But when we are restricted to Pascal’s 32-bit arithmetic we must either resort to multiple-precision maneuvering or use a simple but slow iteration. The multiple-precision technique would be about three times faster than the code adopted here, but it would be comparatively long and tricky, involving about sixteen additional multiplications and divisions.

Page D43, line 20 (12/23/02)

language or 64-bit substitute is advisable.
Once again it is a good idea to use 64-bit arithmetic if possible; otherwise take_scaled will use more than 2% of the running time when the Computer Modern fonts are being generated.

\[
\text{if } j\text{.random} = 0 \text{ then new\_randoms else decre(j\_random)}
\]

Locations of \text{mem} between \text{mem\_min} and \text{mem\_top} may be dumped as part of preloaded base

\[
\text{define } f_i\text{or\_else} = 2 \quad \{ \text{delimiters for conditionals elseif, else, fi} \}
\]

\[
\text{define type\_name} = 30 \quad \{ \text{declare a type (numeric, pair, etc.)} \}
\]

\[
\text{define big\_kern\_token} = 76 \quad \{ \text{the operators ‘kern’ and ‘=:’ and ‘=:l’, etc.} \}
\]

They consist of zero or more parameter tokens followed by a code for the type of macro.

\[
\text{METAFTONT user assigns a type to a variable like } x_{a.b} \text{ by saying, for example, ‘boolean } x[\]a.b’.
\]

\[
\text{variable that is relevant when no attributes are attached to the parent. The attr\_head node has the fields of either a value node, a subscript node, or an attribute node, depending on what the parent would be if it were not structured; but the subscript and attribute fields are ignored, so it effectively contains only the data of a value node. The link field in this special node points to an attribute node whose attr\_loc field is zero; the latter node represents a collective subscript ‘[]}’ attached to the parent, and its link field points to the first non-special attribute node (or to end\_attr if there are none).}
\]

\[
\text{subscr\_head}(q1) = qq1; qq \text{ is a three-word “attribute-as-value” node with type}(qq) = \text{numeric\_type} \text{ (assuming that x5 is numeric, because qq represents ‘x[]}’ with no further attributes), name\_type(qq) = \text{structured\_root, attr\_loc}(qq) = 0, parent}(qq) = p,
\]
The value of variable $x_{20b}$ appears in node $qqq2 = \text{link}(qqq1)$, as you can well imagine. Similarly, the value of `$x.a$' appears in node $q2 = \text{link}(q1)$, where $\text{attr\_loc}(q2) = h(a)$ and $\text{parent}(q2) = p$.

Such save stack entries are generated by \&save commands.

If $\theta_0$ is supposed to have a given value $E_0$, we simply define $C_0 = 1$, $D_0 = 0$, and $R_0 = E_0$.

For the bisected interval are $z'_0 = z_0$ and $z''_0 = z_0 + (Z'_1 + Z'_2 + \cdots + Z'_n)/2^{t+1}$.

out to hold if and only if $x_0 \leq x_1$ and $x_2 \leq x_3$, and either $x_1 \leq x_2$ or $(x_1 - x_2)^2 \leq (x_1 - x_0)(x_3 - x_2)$.

For example, if we start with $(x_1 - x_0, x_2 - x_1, x_3 - x_2) = (X_1, X_2, X_3) = (7, -16, 39)$, the monotonic cubic, then $B(x_0, x_1, x_2, x_3; \frac{1}{2})$ is always between $.06[x_0, x_3]$ and $.94[x_0, x_3]$; and it is impossible for $\bar{x}$ to be within $\epsilon$ of such a number. Contradiction! (The constant .06 is actually $(2 - \sqrt{3})/4$; the worst case occurs for polynomials like $B(0, 2 - \sqrt{3}, 1 - \sqrt{3}, 3; t)$.)

cur_x, cur_y: scaled; { outputs of skew, unskew, and a few other routines }

399. If the segment numbers on the cycle are $t_1, t_2, \ldots, t_m$, and if $m \leq \text{max\_quarterword}$, we have $t_{k-1} \leq t_k$ except for at most one value of $k$. If there are no exceptions, $f$ will point to $t_1$; otherwise it will point to the exceptional $t_k$.

chopped: integer; { positive if data truncated, negative if data dangerously large }
Page D184, line 25
if (internal[autorounding] > 0) ∧ (chopped = 0) then xy_round;

Page D184, line 27
if (internal[autorounding] > unity) ∧ (chopped = 0) then diag_round;

Page D184, line 32
if (internal[autorounding] ≤ 0) ∨ (chopped ≠ 0) then print_spec("\after\subdivision")

Page D185, lines 15–19
\texttt{define procrustes(\#) \equiv if abs(\#) ≥ dmax then}
\texttt{if abs(\#) > max\_allowed then}
\texttt{begin chopped ← 1;}
\texttt{if \#$>$ 0 \texttt{then }\# ← max\_allowed \texttt{else }\# ← −max\_allowed;}
\texttt{end}
\texttt{else if chopped = 0 \texttt{then }chopped ← −1}

Page D185, old line 22
\texttt{p ← cur\_spec; k ← 1; chopped ← 0; dmax ← half(max\_allowed);}

Page D185, old line 28
if chopped > 0 then

Page D196, lines 3–8
The first job is to fix things so that $x(t)$ plus the horizontal pen offset is an integer multiple of the current “granularity” when the derivative $x'(t)$ crosses through zero. The given cyclic path contains regions where $x'(t) ≥ 0$ and regions where $x'(t) ≤ 0$. The \texttt{quadrant\_subdivide} routine is called into action before any of the path coordinates have been skewed, but some of them may have been negated. In regions where $x'(t) ≥ 0$ we have \texttt{right\_type = first\_octant} or \texttt{right\_type = eighth\_octant}; in regions where $x'(t) ≤ 0$, we have \texttt{right\_type = fifth\_octant} or \texttt{right\_type = fourth\_octant}.

Page D196, lines 15 and 16
current pen might be unsymmetric in such a way that $x$ coordinates should round differently in different parts of the curve. These considerations imply that round($x_0$) and that there are similar ways to address other important offsets.

[Also delete the definitions of \texttt{north\_south\_edge}, etc., on lines 11–15; those definitions are never used.]
at \((x_0, y_0)\) and ends at \((x_1, y_1)\), it’s possible to prove (by induction on the length of the truncated
we list it twice (with coordinates interchanged, so as to make the second octant look like
as the list of transformed and skewed offsets to use when curves that travel in the second octant. Similarly, we will have
\[
\begin{align*}
  w_2 \rightarrow (-5, 6) & (-5, 6) (-5, 6) \\
  w_2 \rightarrow (7, -6) & (7, -6) (7, -6) \\
  w_2 \rightarrow (-7, 1) & (-7, 1) (-3, 2) (-3, 2) \\
  w_3 \rightarrow (3, -2) & (3, -2) (3, -2) \\
  w_3 \rightarrow (-3, 1) & (-3, 1) (1, 0) (1, 0) \\
  w_0 \rightarrow (1, 0) & (1, 0) (1, 0) \\
  w_0 \rightarrow (-1, 1) & (-1, 1) (-1, 1)
\end{align*}
\]
in the third; in the fourth; in the fifth; in the sixth; in the seventh; in the eighth.

The \textit{link} field of a pen header node should be \textit{null} if and only if the pen is a single point.

\textit{endpoint}. The cubics all have monotone-nondecreasing \(x(t)\) and \(y(t)\).

In odd-numbered octants, the numerator and denominator of this fraction will be nonnegative; in even-numbered octants they will both be nonpositive. Furthermore we always have \(0 = s_0 \leq s_1 \leq \cdots \leq s_n = \infty\). The goal of \textit{offset_prep} is to find an offset index \(k\) to associate with each cubic, such that the slope \(s(t)\) of the cubic satisfies

\[
\text{if } \abs{du} \geq \abs{dv} \text{ then } \{ s_{k-1} \leq 1 \text{ or } s_k \leq 1 \}
\]

and return towards \(s_{k-1}\) or \(s_k\), respectively, yielding another solution of (\(*\)).
In компьютерах и типографии как в 6 января 2014

Page D246, line 4 from the bottom  
(06/25/04)

durate fields. Hence, for example, the point \((x\text{-coord}(p) - left_v(q), y\text{-coord}(p) + right_u(p))\) also

Page D248, lines 14 and 15  
(01/06/14)
the \(x\)-axis at the point \(((a^2 - b^2) \sin \theta \cos \theta / \rho) + i \rho\), where \(\rho = \sqrt{(a \sin \theta)^2 + (b \cos \theta)^2}\). It
reaches furthest to the right of the \(y\)-axis at the point \(\sigma + i(a^2 - b^2) \sin \theta \cos \theta / \sigma\), where \(\sigma =

Page D248, line 24  
(06/25/04)

\textbf{else} begin \(beta \leftarrow \text{minor_axis}; gamma \leftarrow \text{major_axis}; theta \leftarrow 0;\)

Page D251, line 1  
(01/06/14)

536. Only the coordinates need to be copied, not the class numbers and other stuff. At this point either \(\text{link}(p)\) or \(\text{link(link}(p))\) is \textit{null}. 

Page D251, line 10  
(01/06/14)

\textit{done1: if} \((\text{link}(p) \neq \text{null})\) \textbf{then} \text{free_node(link}(p), \text{knot_node_size});
\text{link}(p) \leftarrow s; \ beta \leftarrow -y\text{-coord}(h);

Page D256, line 2 from the bottom  
(06/25/04)

we have \(2^l u_{\min} = 2^l u_0 + U_{\min}\), etc.; the condition for overlap reduces to

Page D261, line 5  
(06/25/04)

\textit{tol: integer}; \{ bound on the uncertainty in the overlap test \}

Page D262, lines 26 and 27  
(06/25/04)
\(uv \leftarrow uv + \text{int_packets};\) \{ switch from \(l\_\text{packets} \) to \(r\_\text{packets} \}\)
\textit{decr(cur_tt); xy \leftarrow xy - \text{int_packets};} \{ switch from \(r\_\text{packets} \) to \(l\_\text{packets} \}\)

Page D262, line 11 from the bottom  
(06/25/04)
\(xy \leftarrow xy + \text{int_packets};\) \{ switch from \(l\_\text{packets} \) to \(r\_\text{packets} \}\}

Page D274, line 15 from the bottom  
(06/25/04)
\textbf{begin} \textbf{if} \text{serial\_no} > el\_gordo \text{− s\_scale} \textbf{then}
\textit{overflow("independent\_variables", serial\_no div s\_scale);} 
\textit{type(\#) \leftarrow independent; serial\_no \leftarrow serial\_no + s\_scale; value(\#) \leftarrow serial\_no;}

Page D309, line 21  
(06/25/04)

670. We go to \textit{restart} instead of to \textit{switch}, because we might enter \textit{token_state} after the error
728. A suffix or text parameter will have been scanned as a token list pointed to by \texttt{cur\_exp},

\texttt{cur\_type} = \textit{unknown\_boolean} means that \texttt{cur\_exp} points to a capsule node that is in a ring of equivalent booleans whose value has not yet been defined.

\texttt{cur\_type} = \textit{unknown\_string} means that \texttt{cur\_exp} points to a capsule node that is in a ring of equivalent strings whose value has not yet been defined.

\texttt{cur\_type} = \textit{unknown\_pen} means that \texttt{cur\_exp} points to a capsule node that is in a ring of equivalent pens whose value has not yet been defined.

\texttt{cur\_type} = \textit{unknown\_path} means that \texttt{cur\_exp} points to a capsule node that is in a ring of equivalent paths whose value has not yet been defined.

\texttt{cur\_type} = \textit{token\_list} means that \texttt{cur\_exp} points to a linked list of tokens.

\texttt{my\_var\_flag: 0 .. max\_command\_code;} \{ initial value of \texttt{var\_flag} \}

\texttt{begin cur\_type \leftarrow known; cur\_exp \leftarrow 0; free\_node(q, dep\_node\_size);}
Page D380, line 12

\begin{verbatim}
begin type(r) ← known; value(r) ← 0; free_node(p, dep_node_size);
\end{verbatim}

Page D390, lines 2 and 3

by a previous operation. We must maintain the value of \(right_type(q)\) in cases such as ‘\(\ldots\{\text{curl2}\}z\{0,0\}\ldots\)’.

Page D437, line 1

996. And \textit{do_assignment} is similar to \textit{do_equation}:

Page D439, line 10 becomes two lines

\begin{verbatim}
begin nonlinear_eq(v, cur_exp, false); cur_type ← t; goto done;
\end{verbatim}

Page D443, line 11

done: if eq_type(x) \textbf{mod} outer_tag \neq tag_token then clear_symbol(x, false);

Page D452, line 9

though they don’t necessarily correspond to primitive tokens.

Page D476, line 12 from the bottom

\begin{verbatim}
if nl − skip_table[c] > 128 then
\end{verbatim}

Page D483, line 7

\begin{verbatim}
max_tfm_dimen ← 16 * internal[design_size] − 1 − internal[design_size] \textbf{div} ‘10000000;
\end{verbatim}

Page D483, lines 15–17

\begin{verbatim}
if x > 0 then x ← max_tfm_dimen else x ← −max_tfm_dimen;
end;
\end{verbatim}

Page D496, line 2

a pointer to an edge structure. Its mission is to describe the positive pixels in GF form,

Page D500, line 16

\begin{verbatim}
selector ← old_setting; gf_out(cur_length); gf_string(0, make_string); decr(str_ptr);
\end{verbatim}

Page D506, lines 8–10

\textsc{Metafont} it says, for example, ‘\texttt{(preloaded base=plain 1984.2.29)}’, showing the year, month, and day that the base file was created. We have \texttt{base_ident} = 0 before \textsc{Metafont}’s tables are loaded.
Page D514, line 14 from the bottom (06/25/04)

CMMF, should also be provided for commonly used bases such as cmbase.

Page E1, line 3 (01/06/06)

Zillions of alphabets can be generated by the programs in this book. All

Page E6, lines 16–19 (12/29/04)

- square_dots tells whether dots should be square, not rounded;
- hefty tells whether weight-reducing strategies should be used;
- monospace tells whether the characters should all be forced to have the same width;

Page E7, line 11 (12/21/02)

hair, vair, stem, curve, ess, flare, dot_size, bar, slab;

Page E7, line 14 (12/21/02)

crisp, tiny, fine;

and thin_join should not be less than fine.

Page E19, line 19 (11/07/01)

cap_notch_cut 46/36 31/36 25/36 24/36 22/36 25/36

Page E41, line 8 (12/21/02)

extra_endchar ← extra_endchar & "charcode:=charcode+code_offset;";

Page E53, line 7 (12/21/02)

numeric mid_thickness; mid_thickness = Vround 1/3[vair, stem];

Page E125, line 6 from the bottom (07/10/05)

top y₁ = top y₆ = h; z₂ = .5[z₃, z₁] + bend;

Page E125, line 3 from the bottom (07/10/05)

draw z₁ − flourish_change{up} + (0, .15asc.height){up}
... {right}(z₁ + (2u, 0)) --- z₆ ... {down}z₇; % upper bar

Page E146, also pages 164 and 540 (02/08/03)

[The labels on the new illustrations of beta, omega, and spadesuit are too large, and the resolution of the shapes is too small.]
Page E147, line 11 from the bottom (04/23/04)
\[ x_0 = x_1 = x_9; \text{ lft } x_{0r} = \text{ hround}(1.5u - 0.5\text{hair}); x_2 = x_4 = x_6 = x_8 = 0.5w - 0.25u; \]

Page E147, line 8 from the bottom (04/23/04)
\[ y_5 = 0.5[y_4, y_6]; \text{ top } y_{6r} - \text{ bot } y_{4r} = \text{ vstem} + \text{ eps}; \text{ bot } y_{8r} = -\infty; y_7 = y_9 = 0.55[y_6, y_8]; \]

Page E149, line 8 from the bottom (04/23/04)
\[ y_5 + 0.1\text{height} = y_7 = 0.5[y_6, y_8]; \text{ bot } y_{6r} = -\infty; \]

Page E157, line 11 (02/29/08)
\[ \text{ filldraw } z_{1l} - - z_{2l} \ldots (x_3, y_{2l}) \ldots z -- z_{1r} -- \text{ cycle; } % \text{ stem} \]

Page E161, line 7 from the bottom (04/23/04)
\[ \text{ top } y_{1r} = x_{\text{height}} + \infty; y_2 = y_4 = 0.5[y_1, y_3]; \text{ bot } y_{3r} = -\infty; \]

Page E209, line 3 (12/29/04)
\% This lowercase italic alphabet was prepared by D. E. Knuth in December, 1979,

Page E377, lines 3 and 4 from the bottom (12/22/02)
\[
\begin{align*}
\text{ path } p_; p_ = z_\{z_{@1} - z_{@2}\} \ldots \text{ darkness}[z_{@1}, 0.5[z_{@2}, z_{@3}]] \ldots z_{@2} \\
\text{ --- z}_{@1} -- z_{@r} -- z_{@0} -- z_{@8r} -- \text{ cycle; if (y_{@2} > y_@3)} \neq \text{ ypart precontrol 1 of p_} > \text{ ypart postcontrol 1 of p_)}: \\
\text{ p_} = z_\{z_{@1} - z_{@2}\} \ldots \text{ darkness}[z_{@1}, 0.5[z_{@2}, z_{@3}]] \\
\text{ --- z}_{@1} -- z_{@r} -- z_{@0} -- z_{@8r} -- \text{ cycle; fi filldraw p_; } % \text{ arm and beak} \\
\end{align*}
\]

Page E379, lines 17 and 18 become one line (01/06/14)
\% This lowercase italic alphabet was prepared by D. E. Knuth in December, 1979,

Page E379, bottom line of the program (01/06/14)
\[
\text{ math_fit}(0, ic\# - 2.5u\#); \text{ penlabels}(0, 1, 2, 3, 4, 5, 6, 7); \text{ endchar;}
\]

Page E489, bottom line (06/25/04)
\% This lowercase italic alphabet was prepared by D. E. Knuth in December, 1979,

Page E545, line 11 from the bottom (12/29/04)
\% This lowercase italic alphabet was prepared by D. E. Knuth in December, 1979,
Page E551, line 3 from the bottom (12/29/04)
quantities needed in the \texttt{calu} programs are also established at this time.

Page E577, right column (12/23/02)
$p_\varphi$, 305, 377.
padded, 103–111, 117–121, 549.

Page E578, left column (12/23/02)
postcontrol, 347, 377.
precontrol, 347, 377.