

## 10 Mar 1978

- 1 Rename a few external variables to make their first six letters unique. L
- 2 Initialize *escape\_char* to  $-1$ , not 0 [it will be set to the first character input]. §240 D
- 3 Fix bug: The test '*id* < '200' was supposed to distinguish one-letter identifiers from longer (packed) ones, but negative values of *id* also pass this test. §356 L
- 4 Fix bug: I wrote '**while**  $\alpha \wedge (\beta \vee \gamma)$ ' when I meant '**while**  $(\alpha \wedge \beta) \vee \gamma$ '. §259 B
- 5 Initialize the input routines in INITEX [at this time a short, separate program not under user control], in case errors occur. §1337 R
- 6 Don't initialize *mem* in INITEX, it wastes time. §164 E
- 7 Change '*new\_line*' [which denotes a lexical scanning state] to '*next\_line*' [which denotes *carriage\_return* and *line\_feed*] in print commands. B
- 8 Include additional test '*mem*[*p*]  $\neq 0 \wedge$ ' in *check\_mem*. §168 F
- 9 Fix inconsistency between the *eq\_level* conventions of *macro\_def* and *eq\_define*. §277 M
- About six hours of debugging time today.
- INITEX appears to work, and the test routine got through *start\_input*, *chcode* [the T<sub>E</sub>X78 command for assigning a *cat\_code*], *get\_next*, and *back\_input* the first time.

## 11 Mar 1978

- 10 Insert space before '(' on terminal when opening a new file. §537 I
- 11 Put '*p*  $\leftarrow$  *link*(*p*)' into the loop of *show\_token\_list*, so that it doesn't loop forever. §292 F
- 12 Shift the last item found by *scan\_toks* into the *info* field. [With SAIL all packing of fields was done by arithmetic operations, not by the compiler.] §474 L
- 12  $\mapsto$  13 Fix the previous bugfix: I shifted by the wrong amount. §474 B
- 14 Add a feature that prints a warning when the end of a file page occurs within a macro definition or call. [System dependent.] §336 I
- Unintended bugs in my test routine [a format intended eventually to typeset *The Art of Computer Programming*] helped check out the error recovery mechanisms. For example, I had '*\lft{#}*' instead of '*\lft{##}*' inside a macro, and three cases of improper { and } nesting.
- 15 Add the forgotten case '*set\_font:*' to *eq\_destroy*. §275 F
- 16 Change *\require* to *\input*. §376 C
- 17 Add code for the case *cur\_cmd* = 0 [later known as the case '*t*  $\geq$  *cs\_token\_flag*'] when scanning a tokenlist. §357 F
- That's the first "big" error I've spotted so far.
- 18 Introduce a 'd' option in the error routine, to facilitate debugging. §84 I
- 19 Assign a floating-point constant *ignore\_depth* to *prev\_depth*, instead of assigning the integer constant *flag* [since *prev\_depth* is type *real* in T<sub>E</sub>X78]. §215 L
- 20 Improve the readability and spacing of *show\_node\_list* output. §182, 187 I
- 21 Set the variable *v* before using the **case** construction in *show\_node\_list*, because there's one case where *v* didn't receive a value [as part of the field unpacking]. §182 F
- About seven hours today.

## 12 Mar 1978

- One hour to enter yesterday's corrections and recompile.
  - At this point T<sub>E</sub>X correctly located further unintended syntax errors in *acphdr* [the test file].
- 22 Insert *debug\_help* into *succumb*, giving a chance to look at memory before the system dies. §93 I
  - 23 Use *eq\_destroy* wherever necessary in *unsave*. §283 D

- 24 Change ' $t \leftarrow (t - 1) \bmod 8$ ' to ' $t \leftarrow (t - 1)$  and 7' in *id\_name*, since **SAIL** has  $-1 \bmod 8 = -1$ . [At this time, *id\_name* is a routine that unpacks control sequence names, according to a scheme that will become obsolete after change #422.] L
- 25 Remove the space that appears at end of paragraph. (I hadn't anticipated that.) §816 S
- 26 Throw away unwanted *line\_feed* after getting a *carriage\_return* in response to *in\_chr\_w* [a system routine for input from the terminal]. §83 L
- 27 Delete spurious call to *flush\_list* in *end\_token\_list*. §324 B
- *Why did I make such a silly mistake?*
- 28 Fix bug in *get\_x\_token*: I forgot to say '*macro\_call*' (which is the main point of that routine)! §380 F
- *While tracking that bug down, I found out incidentally that kerning is okay.*
  - *Also T<sub>E</sub>X correctly caught an error 0p for 0pt.*
- 29 Fix bug in *scan\_spec* (**while** instead of **repeat**). §404 L
- 30 Make the table entries for **\hfill** and **\hskip** consistent with the program conventions. §1058 M
- 31 Disable unforeseen coercion: When *scan\_spec* put *hsize* on *save\_stack*, the value changed from *real* to *integer*. §645 L
- 32 Use '\*' instead of '-1.0' for running dimensions of rules in *show\_node\_list*. §176 I
- 33 Clear *mem[head]* to null in *push\_nest* [in T<sub>E</sub>X82, this will be done by *get\_avail*]. §216 D
- *A vrule link got clobbered because I forgot to do this.*
- 34 Translate ASCII control codes to special form when displaying them. §48, 68 I
- *Ligatures work, but show\_node\_list showed them funny.*
- 35 Remember to clear parameters off *save\_stack* in *package* routine. §1086 F
- *About eight hours today.*

### 13 Mar 1978

- 36 Introduce a new variable *hang\_first* [later the sign of *hang\_after*]. §849 D
- 36 → 37 Simplify the new code, realizing that if *hang\_indent* = 0 then *hang\_first* is irrelevant. §848 E
- *Time sharing is very slow today, so I'm mostly reading technical reports while waiting **three hours** for compiler, editor, and loading routine.*
  - *I'm not counting this as debugging time!*
  - *(Came back in the evening.)*
- 38 Spruce up the comments in the *line\_break* routine, which appears to be almost working. §813 P
- 39 Rethink the setting of *best\_line*; it's 1 too high in many cases. [The final line of a paragraph was handled in a treacherous way.] §874 D
- 40 Compute proper initialization for *prev\_depth* when beginning an **\hbox** with a paragraph inside. [This refers to a special 'paragraph box' construction, used when an **hbox** of specified size becomes overfull; T<sub>E</sub>X78 doesn't have the concept of internal vertical mode.] §1083 D
- 41 Also initialize *tail* in that case. §1083 D
- 42 Also put the result of line-breaking into the correct list. M
- 43 Fix a typo in the *free\_node* routine ('*link*' not '*llink*'); by strange chance it had been harmless until today. §130 T
- 44 Fix bug: *post\_line\_break* forgot to set *adjust\_tail*. §889 F
- 45 Update *act\_width* properly when looking for end of word while line breaking. §866 D
- 46 Repair the "tricky" part of *get\_node*: I used the *info* field when I meant to say *llink*. §127 B
- *Now the \corners macro of acphdr works! [See \setcornerrules in The T<sub>E</sub>Xbook, page 417.]*

- 47 Reset *contrib\_tail* properly in *build\_page*. §995 D
- 48 Fix typo (– for +) in computation of *page\_total*. §1004 T
- 49 Change the page-breaking logic: T<sub>E</sub>X reached *fire\_up* with *best\_page\_break* = *null* in one case, since the badness was too bad. §1005 S
- 50 Perform the operation *delete\_token\_ref(top\_mark)* only when *top\_mark* ≠ 0. §1012 M
- 51 Make *scan\_toks* omit the initial { of an *\output* routine. §473 F
- 52 Insert a comma to make memory usage statistics look better. §639 I
  - *About seven good hours of debugging today.*
  - *Tomorrow will be first-output day (I hope).*

#### 14 Mar 1978

- *(Came in evening after sleeping most of day, to get computer at better time.)*
- *(Some day we will have personal computers and will live more normally.)*
- *8:30pm, began to enter corrections to yesterday's problems.*
- 53 Issue an error message for non-character in filename or in font name. §771 I
- 54 Display ‘...’ for omitted stuff in *show\_context* routine. §643 I
- 55 Watch out for the SAIL syntax ‘ $\alpha + \beta$  lsh  $\gamma$ ’; it doesn’t shift  $\alpha + \beta$  left (only  $\beta$ ). §464 L
  - *That error was very hard to track down; it created a spurious link field and sent hash[0] = \beta to the scanner!*
  - *I could have found this bug an hour sooner if I had looked at the correct stack entries for name and token\_type.*
- 56 Show the correct page number when tracing pages before output is shipped. §638 D
- 57 Remember to nullify a box after using it. §1079 F
- 58 Issue an error message if *\box255* isn’t consumed by the output routine. §1015 I
  - *I’m having trouble with the BAIL debugger; it makes an illegal memory reference and dies, when single-stepping past the entry to recursive procedures *hlist\_out* and *vlist\_out*. So I have to reload and be careful to go thru these procedures at high speed.*
- 59 Fix bug in comment (memory parameter description said  $\geq$  not  $\leq$ ). §11 P
- 60 Fix typo in definition of rule output (said *x, y* not *x0, y0*). [This part of the code went away when DVI files were introduced.] B
- 61 Correct the embarrassing bug in shellsort, where I said ‘ $\leq str[k]$ ’ not ‘ $\leq t$ ’. [The first T<sub>E</sub>X had to sort all output by vertical position on page.] B
- 62 Make *start\_input* set up *job\_name* in the form needed by *shipout*; it uses obsolete conventions. §532, 537 M
- 63 Insert ( and ) into the SAIL macro definition of *new\_string*. [This macro was for pre-DVI output.] L
- 64 Unscramble the parameters of *out\_rule*: The declaration was (*x0, y0, x1, y1*) while the call was (*x0, x1, y0, y1*). M
  - *4:30am, T<sub>E</sub>X’s first page is successfully output!*
  - *(It was ‘\titlepage\setcpagel\corners\eject\end’.)*

#### 15 Mar 1978

- *10:30pm. Today I’m instrumenting the line-breaking routine and putting it through a bunch of tests.*
- *(The inserted instrumentation had bugs that won’t be mentioned here.)*
- 65 Don’t abort the job when *eq\_destroy* redefines a T<sub>E</sub>X control sequence. §275 C
  - *The first word of a paragraph won’t be hyphenated ... so be it!*
- 66 Fix the typo in *line\_break* that spoils the test for ‘letters in the same font’. §896 T
  - *The effect of that typo was to suppress all hyphenation attempts.*
- 25 → 67 Replace the space at paragraph end by fillglue, not by zero. §816 B
- 68 Pack the hyphen character properly into its node. §582 L
- 69 Fix a typo (‘←’ for ‘+’) in the computation of *break\_width*. §838 T

- 70 Change the `\end` maneuver; the present code doesn't end the job, since I forgot that *back.input* uses *cur.tok*. §1054 M
- 71 Add a parameter to *try\_break*, since the width is different at a discretionary hyphen. [This problem will be solved differently in T<sub>E</sub>X82, when discretionaries become much more general.] §840 A
- 72 Bypass kern nodes in pre-hyphenation. §896 F
- 73 Supply code for the forgotten case '< "a"' in pre-hyphenation. [This case was later generalized to a test of *lc.code*.] §897 F
- 74 Change *mem[q]* to *prev\_break(q)* in the reverse-linking loop. §878 B
- (Such blunders. Am I getting feeble-minded?)
- 75 Introduce special logic for *eject\_penalty*; I was wrong to think that forced ejection was exactly like an infinitely negative penalty. §851 A
- 76 Use  $(1 + b)^2 - p^2$  when computing demerits with  $p < 0$ . §859 A
- 6:30am. *The line-breaking algorithm appears to be working fine and efficiently. On small measures (about 20 characters per line), it gives overfull boxes instead of spaced out ones. Surprising but satisfactory.*

### 16 Mar 1978

- 9pm. *The plan for tonight is to test page breaking and more paragraphing.*
- 77 Insert '`\topskip`' glue at beginning of page. §1001 G
- 78 Add '`\pausing`' feature. §363 I
- 79 Fix discrepancy: In *make\_accent* I called *vpackage* with a pointer to the first list item, but *vpackage* itself assumes that the parameter is a pointer to that pointer. [The *vpackage* of T<sub>E</sub>X82 will be different.] §668 M
- *I checked for other lapses like that. Result: 14 calls OK, 12 NG.*
- 80 Create a new temporary list head location, *hold\_head*, since there's a case where *vpackage* is improperly called with parameter *temp\_head*. [At this time *vpackage* uses *temp\_head* to make a list of all insertions found.] §1014 M
- 11:30pm. *The machine is tied up again.*
- 81 Write code to handle charnodes in *vlists*; I forgot that I'd decided to allow them. [Later I prohibited them again!] §669 F
- 82 Combine the page lists before pruning off glue in *fire\_up*; otherwise the pruning doesn't go far enough. §1017 F
- 25 → 83 Fix typo where line-breaking starts: '*fill\_glue*' should be '*new\_glue(fill\_glue)*'. §816 B
- 84 Add `/q` to `xspool` command (cosmetic change). [This changes a system command that causes T<sub>E</sub>X output to be printed on the Xerox Graphics Printer (XGP), the progenitor of future laser printers; the `/q` option says that the queue of printing requests should be displayed on the user's terminal.] §642 I
- 85 Don't write a form feed after the last page of output. §642 E
- *To fix this, I reorganized ship\_out, and it became simpler.*
- 86 Correct a typo ('←' for '←') in the *vlist\_node* case within *hlist\_out*. [The output routines were quite different at this time, because output went directly to the XGP.] §622 T
- 87 Change the message '`completed page`' to '`Completed for page`'. §638 I
- 48 → 88 Fix yet another typo in the computation of *page\_total*: My original code said *stretch(p)* instead of *stretch(q)* (terrible). §1004 B
- 89 Document the dirty trick about *bot\_mark*'s reference count. [That trick is, fortunately, no longer useful.] §1016 P
- 90 Rethink the algorithm for contributing an insertion: The original code tests for a page break after incrementing the totals but before the *contrib\_list* is updated. [T<sub>E</sub>X78 handles insertions in a hardwired manner that will be greatly generalized in T<sub>E</sub>X82.] A

91 Fix *get\_node* again: After the variable memory overflows, control falls through to *found* instead of going to the *overflow* call. §125 F

- *I spent several hours tracking down that data structure bug!*

92 Change *new\_line* to *next\_line* in yet another print command (see #7). B

75 → 93 Amend the line-breaking algorithm: `\break` in paragraph doesn't work with really bad breaks. §851 A

- *A problem to be diagnosed tomorrow: Each time I run the test program, the amount of memory in use grows by 13 cells not returned.*
- *Seven hours tonight.*

### 17 Mar 1978

94 Introduce *dead\_cycles* to keep `\end` active until *ship\_out* occurs. §1054 G

95 Don't call *line\_break* with an empty list. §1096 E

96 Take proper account of the (infinite) fillglue when computing the width of a paragraph line preceding a display. §1146 S

97 Add a new parameter to *hpack* so that *line\_break* won't be called at the wrong time. [This is for the soon-to-be-obsolete feature described in #40.] M

98 Give a warning message if there's an `\hfill` in the middle of a paragraph; fillglue upsets the line breaker, because floating-point calculations don't have sufficient accuracy. §868 L

- *I spent an hour looking for another bug in T<sub>E</sub>X, but the following one was in METAFONT: The *xgp\_height* data in fonts had been supplied wrong.*
- *It took two hours to recompile 32 fonts with proto-METAFONT.*

99 Make *show\_node\_list* and *show\_token\_list* more robust in the presence of software bugs. §182 R

97 → 100 Do not remove nodes with *eject\_penalty*, when the new parameter to *hpack* is *true*. D

97 → 101 Put a fast exit into *hpack*; e.g., at glue nodes, test '`if paragraphing`  $\wedge$   $\langle$ current width is large $\rangle$ '. E

- *2am. I have to go to bed "early" tonight.*

### 18 Mar 1978

- *3:30pm. (Saturday)*

102 Add a parameter to *check\_mem* (to suppress display unless needed). §167 I

103 Introduce a user-settable parameter `\maxdepth`, and pass it as a parameter to *vpackage*. §668 G

- *I realized the need for `\maxdepth` while fixing insertions (see #90).*

104 Introduce a user-settable parameter for *line\_break*: The constant 2.0 in my original algorithm becomes `\jpar` [later `\tolerance`], to be set like `\tracing`. §828 G

105 Reclaim the *eject\_penalty* nodes removed during line-breaking. §879 D

- *(Those were the 13 extra nodes reported on Thursday.)*
- *The *init\_align* procedure worked right the first time!*
- *Also *init\_row*, *init\_col*. But then...*

106 Rethink the command codes: *endv* in a token list has too high a code for the assumptions of *get\_next*. §207 S

107 Add a *prev\_cmd* variable for processing delimited macro parameters; the original algorithm loses track of braces. [The rules will change slightly in T<sub>E</sub>X82, and *rbrace\_ptr* will take on a similar function.] §400 A

108 Make the *get\_next* routine intercept `&` and `\cr` tokens. §342 S

- *I'd thought I could just put `&` and `\cr` into *big\_switch* [i.e., in the stomach of T<sub>E</sub>X, not the eyes]; that was a great big mistake.*

109 Make more error checks on *endv*; e.g., it must not occur in a macro definition or call. §780 R

- 108 → 110 No, rethink alignments again; the new program still fails! §768 S
- For the first time I can glimpse the hairiness of alignment in general (e.g., ‘`\halign{\u#\v&...}`’ when `\u` and `\v` are defined to include `&`’s and possible alignments themselves).
  - I think there’s a “simple” solution, by considering only whether an alignment is currently active [in §342].
  - 11:30pm. Went to bed.
- 19 Mar 1978**
- Woke up with “better” idea on how to handle `&` and `\cr`.
  - (Namely, to consider a special kind of `\def` whose parameters don’t interrupt on `&`’s and `\cr`’s.)
  - But replaced this by a much better idea (to introduce *align\_state*).
  - 11pm. Began to use computer. Performed major surgery (inserting *align\_state* and updating the associated routines and documentation).
- 111 Pop the alignment stacks in *fin\_align*. §800 D
- 110 → 112 Fix a (newly inserted) typo in *show\_context*. §314 T
- 110 → 113 Set *align\_state* false when a live `&` or `\cr` is found. [Originally *align\_state* was of type *boolean*.] §789 D
- 114 Insert `\cr` when ‘`]`’ occurs prematurely in an alignment. §1132 I
- 115 Remember to record *glue\_stretch* when packaging an unset node. §796 M
- I had a mistake in *acphdr* definition of `\quoteformat`; also extra spaces.
  - My first test programs, used before today, were contrived to test macro expansion, line-breaking, and page layout.
  - Next I’m using a test program based on Volume 2.
- 116 Make carriage-return, space, and tab equivalent for macro matching. §348 C
- 117 Omit the reference count node when displaying a mark. §176 F
- 118 Correct a silly slip: I wrote ‘*type\_displacement*’ instead of ‘*value\_displacement*’ when packing data in a penalty node. §158 B
- 119 Don’t go to *build\_page* after seeing `\noindent`; T<sub>E</sub>X isn’t ready for that. [In the original program, this was an instance of a bad *goto*.] §1091 M
- I had undesired spaces coming thru the scanner in my macro definitions of `\tenpoint` [see The T<sub>E</sub>Xbook, page 414].
  - 4am. T<sub>E</sub>X now knows enough to typeset page 1 of Volume 2!
  - Also it did its first “math formula” (namely ‘`$$`’) without crucial error.
  - (Except that the italic correction was missing for some reason.)
- 120 Remember to decrement *cur\_level* in *fin\_align*. [The routines will eventually become more general and use *unsave* here.] §800 D
- 121 Remember to increment *cur\_level* in error corrections by *handle\_right\_brace*. [A better procedure will be adopted later.] §1069 D
- 122 Fix a typo: (‘`{`’ instead of ‘`}`’) in error message for *mmode* + *math\_shift*. §1065 T
- 99 → 123 Make *show\_noad\_list* more robust and more like the new *show\_node\_list*. [The routines will be combined in T<sub>E</sub>X82.] §690 R
- 124 Fix a typo in *char\_box*: should say *font\_info\_real*. [In T<sub>E</sub>X78 a single array is used for both *real* and *integer*; in T<sub>E</sub>X82 things will be *scaled*.] §554 L
- 125 Fix typos in the definitions of *default\_rule\_thickness* and *big\_op\_spacing*; they shouldn’t start at *mathe*x(7). §701 B
- 126 Reverse the *before* and *after* conventions in math nodes. §1196 B
- I had them backwards; this turned hyphenation on just before *math*, and off just after it!
  - Seven and a half hours debugging today. Got through the test program a little more. But T<sub>E</sub>X blew up on ‘`$Y+1$`’; tomorrow I hope to find out why.

## 20 Mar 1978

- 8pm. I decided to work next on a super-hairy formula.

- 127 Change ‘`\asci`’ to ‘`\cc`’ (character code). [This name will change again later, to ‘`\char`’.] §265 C
- 128 Don’t bother to store a penalty node at the beginning of `$$` when the paragraph-so-far fits on a single line, since such a penalty has already been stored. [These conventions will change later, and the `\predisplaypenalty` will always be stored.] §1203 E
- 129 Avoid reference to *tail* in *build\_page*, if *nest\_ptr* > 0. §995 S
- 130 Correct a silly slip in *math\_comp* (the exact opposite of what I did in #118). §1158 B
- 131 Rectify my mental lapse in *make\_fraction*; I said *nucleus* instead of *thickness*. §743 B
- 132 Mask off the math class when scanning delimiters. §1160 F
- 133 Allow an optional space after `\def{...}`. [This decision will be retracted later.] §473 C
- My test example is so complicated it causes the semantic stacks to overflow!
- 134 Don’t test for no pages output by looking at the channel status. §642 L
- 135 Fix typo in definition of `\mathop` (*open\_noad* not *op\_noad*). §1156 T
- 136 Rewrite *fin\_mlist*, because ‘`\left(...\above...\right)`’ doesn’t parse correctly; the `\left` goes into the numerator, the `\right` into the denominator. §1184 A
- 137 Correct the use of *depth\_threshold* in *print\_subsidary\_data*: Simple fields get shown while others look empty. §692 B
- 78 → 138 Return the carriage before showing the first line of a new file when pausing. §538 I
- 139 Fix bug: The call *show\_noad\_list(mem[...])* should be *show\_noad\_list(...)*, in the *incompleat\_noad* case of *show\_activities*. §219 M
- 3am. The whole messy formula has been parsed correctly into a tree.
  - The easy part is done, now comes the harder part.
- 140 Don’t shift single characters down in *make\_op*. §749 F
- 141 Make *clean\_box* return a box (as its name implies), not an hlist. §720 D
- Font info still isn’t quite right, it has the wrong value of *quad*.
- 142 Retain the italic correction when doing *rebox*; can make *glue\_set* ≠ 0 a flag for this. [A better solution will be adopted later.] §715 A
- 143 Fix the bug that makes *rebox* bomb out: *value(p)* should be *value(mem[p])*. §715 B
- 6am; ten hours today. T<sub>E</sub>X didn’t do  $\pi$  over 2\$ correctly, but was close.
  - I found that the *rebox* problem (#142) went away when I fixed the *clean\_box* problem (#141); but I will leave the extra stuff about *glue\_set* ≠ 0 in the program anyway, just for weird cases.
- 144 Omit extra levels of boxing when possible in *clean\_box*. §721 E
- (To do this, I need to face the *rebox* problem anyway.)

## 21 Mar 1978

- 10pm. The computer is rather heavily loaded tonight.
- 145 Don’t forget *thickness* when making a square-root sign (see #131). [The rule *thickness* will later be derived from the character height.] §737 F
- 146 Define *p* local to the *make\_fraction* routine. §743 L
- Unwittingly using the global *p* was a disaster.
- 147 Don’t show the amount of *glue\_set* when it’s zero. §186 I
- 142 → 148 Make *glue\_set* nonzero in the result of *var\_delimiter*. §706 D
- 149 Fix bug: The *math\_glue* function didn’t return any result. §716 F
- 150 Fix typo in *char\_box* (*c* not *w*); this caused a subscripted *P* to come out the same width as an unsubscripted *P*. [Later changes in the rules will move this computation to §755.] §709 T
- 144 → 151 Revise *clean\_box* to do operations that are needed often because of the *rebox* change. §720 P
- 152 Use the new *clean\_box* to avoid a bug in `\sqrt{\raise{...}}`. §737 D



- 153 Change the definition of `\not` so that it's a relation (which will butt against the following relation). [All math symbols and Greek letters are defined in INITEX at this time, not in a changeable format definition.] Q
- 154 Give error message '**Large delimiter must be in mathex font**', instead of calling *confusion*, since the error can occur. [This particular error is impossible in T<sub>E</sub>X82.] §706 I
- 155 Change the use of *p* in *var\_delimiter*; it isn't always set when I say **goto found**. §706 F
- Another font problem now surfaced: The mathex meta-font didn't compute T<sub>E</sub>X info in a machine-independent way. (It took two hours to correct this.)
- 156 Don't forget to set *type(b)* in all relevant cases of *var\_delimiter*. §708 D
- 157 Use the correct sign convention for *shift\_amount* in *hpackage*. §653 B
- 158 Always kern by *delta* when there's no superscript. §755 F
- 159 Declare *space\_table* to be [0..6, 0..6] not [0..7, 0..7]; otherwise its entries are preloaded into the wrong positions. [The *space\_table* in T<sub>E</sub>X78 is 7 × 7; it will become 8 × 8 in T<sub>E</sub>X82, represented as a string called *math\_spacing*.] §764 M
- 160 Use a negative value, not zero, to represent a null delimiter. [Actually zero will come back again later.] §685 C
- 127 → 161 Change `\cc` to `\char`. §265 C
- 162 Don't use tricky subtraction on packed data when changing *q* to an *ord\_noad* in *mlist\_to\_hlist*; subtraction isn't always safe. §729 L
- 163 Fix two typos in the *space\_table* (\* for 0). §764 B
- 164 Initialize *cur\_size* everywhere (I forgot it in two places). §703 F
- 165 Reset *op\_noad* before resetting *bin\_noad*. §728 A
- 166 Treat *display\_style* + *cramped* the same as *display\_style* inside *make\_op*. §749 F
- 167 Shift the character correctly in the non-`\displaystyle` case of *make\_op*. §749 B
- Still another font problem: The italic corrections are wrong because the corresponding array was declared *real* in proto-METAFONT (and italic corrections were used in nonstandard way in mathex).
- 168 Use *depth* instead of *height* in *var\_delimiter*. [Later, both were used.] §714 B
- 169 Skew the accents according to the font *slant*. [Soon retracted.] §741 Q
- At this point I think nearly all the math routines have been exercised.
  - Tomorrow they should work!
  - Eight hours debugging today.
- 22 Mar 1978**
- (Wednesday, but actually Thursday: I began at midnight because I was proof-reading a paper.)
  - I checked out the font access tables, slowly (i.e., all the `\mathcode` and special-character name entries were catalogued).
- 169 → 170 Do **not** consider slants after all in the math accent routine, since slanted math letters are put differently into fonts. §741 Q
- 171 Don't use *q* for two different things simultaneously in *make\_math\_accent*. §738 B
- 172 Fix bug in *compact\_list* (I forgot to advance the loop variable). [This procedure became unnecessary in T<sub>E</sub>X82.] F
- 173 Avoid conflict between *var\_delimiter* and *mlist\_to\_hlist*, which want to use *temp\_head* simultaneously. §713 M
- 174 Fix bad typo in *overbar* routine (*b* for *p*). §705 T
- Finally T<sub>E</sub>X got to *after\_math* after dealing with that hairy formula...
- 175 Fix another bad typo: *p* for *b* this time. §1199 T
- 176 Insert more parentheses (twice) because of '`lsh`' precedence in SAIL. §1199 L
- 36 → 177 Use the new hanging-indentation conventions when formatting displayed equations. §1199 M
- 178 Recompute penalties so that break is allowed after *punct\_noads*. §761 Q



- 179 Center the large delimiters vertically. §749 F
- 180 Round all rule sizes (up) before drawing them. §589 Q
- 181 Provide more space over  $x$  in  $\sqrt{x}$ , and more space atop vincula. §705, 737 Q
- 182 Make large delimiters large enough to cover formula height (important for subscripts, superscripts). §762 Q
- 183 Insert `/ntn=33` on XGP prompt message so that complex math won't blow the device driver. [See #84.] I
- 161 → 184 Update the comment about the meaning of `\char`, since it can be used in math mode. §208 P
  - *Six hours today.*

### 23 Mar 1978

- *11pm, Maundy Thursday.*
- 104 → 185 Make `\tracing` and `\jpar` follow block structure. §283 C
  - *It took me two hours to enter yesterday's corrections, because the changes were so numerous.*
- 186 Fix bad call on `begin_token_list` when marks are to be scanned. §396 M
  - *Now the formula looks like it should, modulo problems in fonts.*
- 187 Prevent an exponent from going below baseline + `xheight/4`. §758 Q
- 188 Change `quad` to `math_quad` when finishing a display (several places). §1199 B
- 189 Don't use `append_to_vlist` when putting an `\eqno` box on a separate line, because the page shouldn't break at glue there. [Later, the `append` will be used but preceded by an infinite penalty.] §1205 A
- 190 Increase the input `stack_size`; T<sub>E</sub>X may need to back up a lot. §11 S
- 191 Don't assume that  $p$  always points to a glue node when a page is broken. §1017 A
- 192 Use `epsilon` in `scan_spec` (I had used a different small constant). [This was a kludge to avoid the extra parameter later called *exactly* or *additional*.] §645 A
- 193 Introduce a new procedure `scan_positive_length`, to prevent negative or zero lengths in `scan_rule_spec`. [This restrictive rule will be "overruled" later.] §463 R
- 194 Fix ridiculous bug in the leaders routine of `vlist_out`: I had the initialization *inside* the loop! §635 B
- 195 Eliminate confusion between the two temp variables named  $h$ ; one is *real* and the other is *integer*. §629 L
- 196 Include forgotten case (`leader_node`) in `hlist_out`. [Type `leader_node` will be absorbed into `glue_node` in T<sub>E</sub>X82.] §622 F
- 197 Don't forget to compute  $x0$  in variable horizontal rules. §624 F
  - *Seven and a half hours today.*
  - *T<sub>E</sub>X seems to be ready to tackle my test file based on Volume 2.*
- 198 Calculate `y00` in horizontal rules as an integer number of pixels from the baseline, so that the baseline doesn't jump. §589 S

### 25 Mar 1978

- *2am Saturday. (Might as well drop Friday.)*
- 185 → 199 Make `def_code` consistent with the new `\tracing` conventions. [Many tracing options are packed into a single parameter called `\tracing`.] §1233 D
- 185 → 200 Don't allow users to change nonexistent things like `\catcode1000`. §1232 R
- 110 → 201 Reset `align_state` at beginning of `init_align`. §774 F
- 202 Don't forget `scan_left_brace` after `\noalign`. §785 F
- 110 → 203 Set `cur_cs` ← 0 in `get_next`, after `\cr` causes a switch to the  $\langle v_j \rangle$  template. §342 F
  - *Ouch, that was a big bad bug, which took me three hours to find (since I thought T<sub>E</sub>X's low-level scanning mechanism was working).*

- *Note to myself: I knew it would be cleaner to define `get_next` so that it sets `cur.cs` to zero every time it begins [i.e., in §341, where this change will in fact be made in T<sub>E</sub>X82]. But I had avoided this on grounds of efficiency in the inner loop. Well, now I have earned this tiny bit of efficiency.*
- 204 Prohibit the first word of an unavailable node from becoming negative. [The storage allocator of T<sub>E</sub>X78 uses a negative value to signify a node that is available, just as ‘`link = max_halfword`’ will signal availability in T<sub>E</sub>X82.] §124 D
  - *That was another bad one, it’s not my night.*
  - *At least I’m developing more subtle diagnostic techniques.*
- 205 Remember to un-negate the top *save\_stack* entry when *handle\_right\_brace* finishes an *insert\_group*. [This routine was completely revised in T<sub>E</sub>X82.] §1100 M
- 185 → 206 Initialize `\jpar` [i.e., `\tolerance`]. §240 F
- 207 Correct the display of insertion nodes by *show\_node\_list*. §188 B
- 208 Prevent *show\_token\_list* from generating really long strings when in a loop. §292 R
- 209 Increase the reference count of *bot\_mark* when *vpackage* finds it. [This was later the job of *fire\_up*.] §1016 D
- 210 Remember that the tokenlist for a mark ends with a `}`. §1101 M
- 211 Don’t let *vpackage* lose the top insert. (It fails when the very first item is a `\topinsert`.) §1014 D
- 212 And when that stupid code is corrected, make it handle insertions first-in-first-out. §1018 A
  - *Seven hours today.*

### 26 Mar 1978

- *Easter Sunday, will work till sunrise.*
- 213 Add an ‘i’ feature to the *error* recovery routine. §87 I
- 214 Include a prompt. §87 I
- 215 Ignore space after `\noalign{...}`. §1133 C
  - *Otherwise, things are going well tonight; I’m finding more bugs in my test program than in T<sub>E</sub>X.*
  - *The ‘i’ feature is proving to be very helpful.*
  - *I increased the size of *mem* (now *lo\_mem\_max* = 3500, *mem\_max* = 10000).*
  - *In fact I just needed to increase it again (now *lo\_mem\_max* = 4500, *mem\_max* = 11000).*
- 216 Make INITEX output *mem\_top* for consistency checking. §1307 R
- 217 Calculate the size of delimiters by considering the enclosed formula’s distance from the axis, not from the baseline. §762 A
  - *I’m having trouble with a SAIL compiler bug; I must rearrange the program, more or less at random, until it compiles correctly. I hope the bug isn’t more severe than it appears.*
- 210 → 218 Don’t put a new group on *save\_stack* if a null mark is expanded. [T<sub>E</sub>X82 will remove the ‘J’ from the mark text.] §386 D
  - *I had to redo the typewriter-style font since its width tables were wrong.*
  - *And I increased low-memory size again to 5500, then 6500.*
  - *Finally the entire test program was T<sub>E</sub>Xed. Happy Easter! Six hours today.*

### 27 Mar 1978

- *Beginning at 2:30am.*
- 219 Move `\vcenter` processing to the first pass of *mlist\_to\_hlist*; otherwise the height, depth, subscripts, etc., are way off. §733 A
- 220 Omit space after closing `$$`. §1200 C
  - *Spacing is wrong in the formula  $Y_1 + \cdots + Y_k$ ; I have to rethink the use of three dots.*

- 221 Make conditional thin space available to user as `\s`. [Later will retract this.] §226 G
- 222 Introduce `\dispaskip` and `\dispbskip` [later called `\abovedisplayshortskip` and `\belowdisplayshortskip`]. §226 Q
- *Reminder: I need to test line-breaking with embedded math formulas.*
- 223 Make sure that *interaction*  $\neq$  *error\_stop\_mode* in the ‘Whoa’ error [*fatal\_error*]. §93 I
- 224 Fix a big mistake in the *style\_node* routine (which points to a glue spec, not to glue itself); somehow this didn’t cause trouble yesterday. [In T<sub>E</sub>X78, style nodes double as placeholders for math glue like thin spaces.] §732 B
- 225 Make `\fntfam` obey group structure. [T<sub>E</sub>X78’s `\fntfam` operation is a combination of T<sub>E</sub>X82’s `\textfont`, `\scriptfont`, and `\scriptscriptfont`.] §1234 C
- *At this point the test routine for Volume 2 works perfectly.*
  - *But I will change the page width in order to check harder cases.*
- 178  $\mapsto$  226 Disable automatic line breaks after punctuation in math (e.g., consider  $f(x, y)$ ). §761 Q
- 227 Represent italic corrections as boxes, not glue, so that they won’t be broken. [The `\kern` command doesn’t exist yet.] §1113 S
- *Eight hours today.*
- 228 Fix a bug that just clobbered the memory: Call *free\_avail*, not *free\_node*, in the *ins\_node* case of *vpackage*. [This logic will change completely in T<sub>E</sub>X82.] §1019 B

### 29 Mar 1978

- *(Wednesday) Again beginning at 2:30am.*
- 229 Put still more space above and below fraction lines in displayed formulas. §746 Q
- 189  $\mapsto$  230 Install an infinite penalty feature, which positively suppresses breaks; use it in displayed formulas whose `\eqno` doesn’t fit. §1205 G
- 231 Call *build\_page* after finishing a display; and don’t go to the `\noindent` routine because of the next remark. §1200 F
- 232 Put `\parskip` glue just before a paragraph, not just after (since it interferes with a penalty after). §1091 S
- *Although the test program gives correct output, it generates 46 locations of variable-size memory and 280 of one-word memory that are not freed.*
- 233 Recycle the ulists and vlists in *fin\_align*. §801 F
- 25  $\mapsto$  234 Fix bug when deleting space at end of paragraph: *delete\_glue\_ref*(*cur\_node*) not *delete\_glue\_ref*(*value*(*cur\_node*)). §816 M
- *There’s also a more mysterious type of uncollected garbage, a *fraction\_noad* corresponding to `$p\choose$`, an *incompleat\_noad* not completed.*
  - *Couldn’t find that one, so I recompiled with #233 and #234 corrected.*
  - *Now it gains just 10 locations of variable-size memory and 7 of the other kind.*
- 235 Extend *search\_mem* to search *eqtb* also. §255 I
- 143  $\mapsto$  236 Fix bug in *rebox* when *list\_ptr*(*b*) = 0. §715 D
- *The seven one-word nodes were generated by this bug; rebox put them onto a linked list starting with *mem*[0], growing at the far end!*
- 237 Remember to complete each *incompleat\_noad*. §1184 D
- *This solved the other mystery. I had never noticed that my test output was actually wrong: `$p\choose k$` came out as ‘k’.*
  - *After these corrections, the test routine worked . . . I feel that T<sub>E</sub>X is now pretty well debugged (except perhaps for error recovery)—it’s time to celebrate!*

### 1 Apr 1978

- 238 Don’t quit after file lookup fails. §530 I

### 2 Apr 1978

- 239 Add *T<sub>E</sub>X\_font\_area*, so that it’s easier to change the default library area associated with a device. §514 P

**3 Apr 1978**

- 240** Insert parentheses again, to cope with the precedence of `lsh` when packing data. (See #55 and #176.) §1114 L
- *I had never tried `hmode` + discretionary before!*
- 241** Remember that `back_error` requires `cur_tok` to be set. (Problem can arise during error recovery on parameter `#n` with  $n$  out of range.) §476 M

**4 Apr 1978**

- 242** Add a deletion feature to the `error` routine. §88 I

**5 Apr 1978**

- 243** Reset `space_factor` after `\/` [this was later rescinded] and after math in text. §1196 Q

**10 Apr 1978**

- 104 → **244** Replace `\jpar` and `\tracing` by a new primitive `\chpar` for parameters. It allows a user to change those quantities as well as the penalties for hyphens, relations, binary ops, widows. §209 G

**14 May 1978**

- *Beginning to typeset a real book (Volume 2, second edition), not just a test.*
- 245** Make math in text end with spacing as if it were followed by punctuation. [This rule will soon be rescinded.] §760 Q
- 246** Insert `\times` into the hash table; I left it out by mistake. [It will eventually move into `plain.tex`.] F
- 247** Change the names of Scandinavian accents from `\o`, `\oslash`, `\Oslash` to `\a`, `\o`, `\O`. [This will also move to `plain`.] C

**17 May 1978**

- 248** Fix a silly bug that hasn't been tweaked until today: '`\halign to size`' [obsolete in `TEX82`] used `vsize` instead of `hsize`. §645 B

**19 May 1978**

- 249** Add a `\topbaseline` feature [later called `\topskip`]. §1001 G
- 245 → **250** Subtract the math spacing change of May 14. §760 Q
- 251** Skip past blanks in the `scan_math` procedure. [This blank-skipping will eventually go into `scan_left_brace`.] §403 A
- 252** Introduce a `missing_brace` routine [later generalized] to improve error recovery in `mmode` + `math_shift`, when the top of `save_stack` isn't a `math_shift_group`. §1065 I
- 253** Adjust the math spacing between closing parentheses and `Ord`, `Op`, `Open`, `Punct`. §764 Q
- 254** Make the underline go further under. §735 Q
- 96 → **255** Compute the proper natural width when a displayed equation follows a paragraph whose fillglue has been deleted by `line_break`. §1146 S

**20 May 1978**

- 256** Fix the spurious value of `prev_depth` inside alignments. §775 A
- 257** Consider (and defeat) the following scenario: The `u` and `v` lists are built in `init_align` using `temp_head`; then while scanning '`\tabskip 2pt\rt{...}`' the macro `\rt` is expanded, clobbering `temp_head`. §779 S
- *That bug was more subtle than usual.*
- 258** Add the parameter `num3`, so that the positioning of `\atop` can be different from that for fractions. §700 Q
- 259** Add new parameters `delim1` and `delim2`, so that `\comb` can use fixed size delimiters, not computed as with `\left`. §748 Q

**22 May 1978**

- 221 → **260** Change `\≤` to `\≥` and introduce `\≤` as the negative of `\≥`. [Later obsolete.] §226 C

- 261 Fix the display of negative penalty nodes; *show\_node\_list* is confused when a negative value has been packed into the middle of a word. §194 L
- *Memory overflow just occurred with `lo_mem_max` = 7500 and `mem_max` = 16384. So I have to go to 15-bit pointers. (A problem on 32-bit machines?)*

### 23 May 1978

- 262 Add a new parameter *big\_op\_spacing5*, for extra space above and below limits of big displayed operators. §751 Q
- 263 Initialize *incomplete\_noad* in `$$\halign{...}$$`. §775 F
- *That was another heretofore-untested operation. How much of the code has not yet been exercised?*
- 238 → 264 Close the file when doing lookup-failure recovery. §27 F
- 265 Improve the error recovery for ‘Extra &’. §792 I
- 266 The top piece must be calculated mod 128 in *var\_delimiter*, to guarantee a valid subscript range. [Obsolete in T<sub>E</sub>X82.] §546 R
- 252 → 267 Fix a blunder in new *missing\_brace* code. §1065 B
- 262 → 268 Fix a blunder in new code for limits on display operators. §751 B

### 26 May 1978

- 269 Don’t insert a new penalty after an explicit penalty in math mode. §767 Q
- *The hash table overflowed; I ought to make it much bigger.*
- 110 → 270 Avoid possible bad memory references in alignment when there is erroneous input after `\cr`. [Instead of *extra\_info*, the value of *cur\_align* in T<sub>E</sub>X78 is negated, because we need only distinguish `\cr` from `&`.] §789 R
- 271 Make the dimension parameters like `\hsize` all global, so that they can be set in the `\output` routine. §279 S
- *This led to major simplifications, also to major surgery.*
  - *[But it was a kludgy decision, overruled in T<sub>E</sub>X82.]*
- 94 → 272 Don’t forget to set the type of the new null box in the `\end` routine. §1054 D

### 27 May 1978

- *The data overflowed memory again, both low and high, doing Section 3.3.2.*
- 184 → 273 Mask off extra bits of `\char` in math mode, to avoid bad memory references. §1151 R
- 274 Zero out the negative `\medmuskip` in script styles. §732 B

### 29 May 1978

- 275 Be prepared to handle an undefined control sequence during *get\_x\_token*. (Can fix this by brute force, using *get\_token* instead of *get\_next*.) §380 S
- 276 Correct the superscript shift when a single character is raised. §758 D
- 184 → 277 Mask off all but 7 bits in `\char` routine, to avoid space-factor index out of range. §435 R
- *More memory capacity overflows.*
- 22 → 278 Fix T<sub>E</sub>X’s overflow stop so that I don’t have to wait for loading of the BAIL debug routines. [System dependent.] §93 E
- 279 Remember to adjust the page number when a file page ends in mid-macro. [System dependent.] §306 F

### 5 Jun 1978

- 280 Make sure that the arguments of positioning commands don’t overflow their field size. §610 R
- 281 Report the excess amount when giving an overfull box warning. §666, 677 I

### 7 Jun 1978

- 282 Use  $\geq$  instead of  $>$  as termination criterion in *var\_delimiter*. §714 Q
- 283 Disallow `\eject` in math mode. [In T<sub>E</sub>X78, `\eject` is distinct from `\break`; in horizontal mode it includes T<sub>E</sub>X82’s ‘`\vadjust{\break}`’.] §1102 R

284 Don't put too much clearance above `\sqrt` in text style. §737 Q

### 9 Jun 1978

110 → 285 Make `align_state` an integer variable, not *boolean*, so that `\eqalign` can be within another `\eqalign`. §309 G

286 A `\mark` should expand its input. §1101 C

### 10 Jun 1978

287 Provide for preloading of fonts. §1320 E

288 Close the output file before switching to edit the input file with the 'e' option. §84 L

289 Return adjustments found by *hpack* to free storage if they're not used. [Later, *hpack* will detach them only when they're used.] §655 E

290 Strive for consistency between *make\_under* and *make\_over*. §735 Q

### 18 Jun 1978

236 → 291 Fix a serious error in *rebox* ('b' instead of 'list\_ptr(b)'). §715 B

- *Strange that such a bug would now surface for the first time!*

292 Remove `\deg` from INITEX, since macros suffice. C

293 Add an extra hyphenation penalty for two hyphenated lines in a row. §859 Q

### 19 Jun 1978

294 Introduce the '*no\_new\_control\_sequence*' switch. Among other things, this will prevent an undefined control sequence following *scan\_math* from clobbering the save stack. §259 S

### 20 Jun 1978

295 Change the badness test '*glue* ≤ 0.0' to '*glue* ≤ 0.0001'. [T<sub>E</sub>X82 will avoid such problems by calculating badness without floating point arithmetic.] §99 L

296 Force *badness* to be at most 10<sup>19</sup>. §108 R

297 Add *end\_template* for better error recovery in alignments. §375 I

287 → 298 Make INITEX more like the real T<sub>E</sub>X; my simple scheme for font preloading was no good because it left thousands of 'dead' words in memory. §8 E

299 Economize disk space by using internal arrays in load modules that aren't being reinitialized. [System dependent.] E

300 Move the declaration of *mem* to the semantics module, so that the object code will be more efficient. [System dependent. The code of T<sub>E</sub>X78 was divided into separately compiled modules for syntax, semantics, output, extensions, and general organization.] E

### 21 Jun 1978

- *Today I'm working on the user manual.*

301 Disallow `\input` except in vertical mode. [I will change this in T<sub>E</sub>X82, treating `\input` as a case of expansion.] §378 C

302 Add error recovery for *endv* and *par\_end* occurring in math mode. §1047 I

303 Generalize `\ift` to `\if` T. §506 G

### 22 Jun 1978

304 Preload the `\bullet` [later done by *plain.tex*]. F

256 → 305 Get the correct *prev\_depth* at the beginning of an alignment. §775 D

306 Change `\eject` so that it ejects only once. §1000 C

### 14 Jul 1978

307 Look in standard area if a file isn't found in the user's area. §537 I

308 Echo all online inputs in the transcript file. §71 I

### 19 Jul 1978

309 Equalize spacing when only one of numerator/denominator is big. §745 Q

310 Prevent subscript from getting too high above baseline. §757 Q

- 311** Avoid infinite loop when stack overflows: *push\_input* should say ‘if *input\_ptr*  $\geq$  *stack\_size*  $\wedge$  *interaction* = *error\_stop\_mode*’. §321 R

## 22 Jul 1978

- 312** Make `\quad` meaningful outside math mode. (All fonts must be generated again!) §558 C
- 313** Show the nesting level at the end of *show\_activities*. [But I decided not to do this in T<sub>E</sub>X82.] §218 I
- 314** Put in `\>` [namely, `\mskip\medmuskip`; T<sub>E</sub>X78 already has  $\geq$ , for conditional `\thinmuskip`, as well as the negative amounts  $<$ ,  $\leq$ ]. Change the name of vector accent from `\>` to `\b`. [Math spacing operators will become much more general in T<sub>E</sub>X82.] §716 C

## 25 Jul 1978

- 94  $\mapsto$  **315** Give the correct `\hsize` and `\vsize` to the null boxes created at `\end`. §1054 Q
- 94  $\mapsto$  **316** And don’t “append” them. [Later this was changed, so that it would work better with generalized output routines.] §1054 A
- 297  $\mapsto$  **317** Remove the control sequence `\endv`, since error recovery is now better. §375 I
- 318** Define another mode of tracing: It says ‘OK’ and stops after `\showlists`. §1298 I
- 244  $\mapsto$  **319** Give better defaults to parameters. [Later done by `plain.tex`.] §209 Q
- 320** Allow more bits in the packed representation of `\showboxdepth`. §238 I
- 321** Scan past delimiters and/or dimensions when recovering from ambiguous fractions. §1183 I
- 322** Reduce accent numbers modulo 128 or 512, depending on the mode. §1165 R
- 323** Include a warning, ‘`(\end occurred on level ...)`’. §1335 I

## 28 Jul 1978

- (*I’m writing Chapter 27 of the manual: ‘Recovery From Errors’.*)
- 324** Improve the error message in *scan\_digit*. [This procedure will change its name to *scan\_eight\_bit\_int*, when the number of registers increases from 10 to 256.] §433 I
- 325** Don’t report overfull boxes if they’re less than .1 point over. §666, 677 I
- 326** Give the user extra chances to define the font, if *read\_font\_info* is unsuccessful. §560 I
- 327** Change default recovery for bad parameter number from `#1` to `##`, since `#1` won’t always work and since `##` is probably intended. §479 I
- 328** Omit the “Negative?” message on things like *scan\_char\_num*. §435 I
- 329** Improve error recovery when a large delimiter isn’t in family 3. [Obsolete.] I
- 330** Give a more appropriate error message when the input is ‘`$\right`’. §1192 I
- *Currently T<sub>E</sub>X says ‘Missing \$’!*
- 331** Call *back\_input* before the error message in *back\_error*, not afterwards. §327 I

## 1 Aug 1978

- 332** Give an appropriate warning when there’s no input file and the user types ‘e’. §84 I
- 333** Increase the system pushdownlist size so that the manual will compile. [Procedures *hlist\_out* and *vlist\_out* can recurse deeply.] L
- *Yesterday I distributed 45 preliminary copies of the manual; today I took out the “debugging hooks” and put T<sub>E</sub>X up as a system program.*

## 2 Aug 1978

- *I’m typing Volume 2 again (currently in Section 4.2.2). Culture shock!*
- 334** Introduce a `\ragged` parameter, to indicate a degree of raggedness. [Previously, ragged-right setting was performed when the `\tolerance/100` was odd! Eventually a better approach, with `\rightskip` and such things, will be discovered.] §886 G
- 335** Omit the ‘widow penalty’ in one-line paragraphs. §890 Q



**5 Aug 1978**

- 336** Generalize `\pageno` to `\count(digit)`. §236 G
- 285 → **337** Update *align\_state* when recovering from ‘Missing {’ and ‘Extra }’ errors. §1069, 1127 D
- 338** Show “runaway” tokens, making it easier to pinpoint an error. §306 I

**22 Aug 1978**

- 339** Add `\predisdisplaypenalty`. §1203 G
- 340** Clarify error messages; they should indicate when something has been inserted, etc. §1064 I

**23 Aug 1978**

- 114 → **341** Substitute ‘Extra }’ for the losing ‘Missing \cr’ error message. §1069 I
- 213 → **342** Go past online insertions in *show\_context*. §311 I
- 343** Exact no penalty for breaking one line before a display. §1145 Q
- 338 → **344** Check for runaways at end of file. §362 I
- 345** Give error message when a macro argument begins with } . §395 I

**24 Aug 1978**

- 213 → **346** Remove extra line-feed in *show\_context* after printing insertions. [System dependent.] §318 L

**25 Aug 1978**

- 347** Leave no glue at top of page, even after `\eject`. §997 Q

**27 Aug 1978**

- 348** Adopt Guy Steele’s new version of the  $\text{\TeX}$  source files. [He has recently made a copy and modified it by introducing compile-time switches for MIT conventions as an alternative to SUAI. This is the first time that  $\text{\TeX}$  is being ported to another site; additional switches for PARC, TENEX, TOPS10, and TOPS20 will be added later, using the Steele style.] P

**1 Sep 1978**

- 349** Don’t pass over leader nodes in the *try.break* background computation. [At this time, leaders have not yet been unified with glue.] §837 Q
- 82 → **350** Prune away all penalties at the top of a page. §997 Q

**4 Sep 1978**

- 338 → **351** Include ‘\’ in error message about a runaway argument. §306 I

**8 Sep 1978**

- *I just remade all the fonts, with increased ligature field size.*
- 350 → **352** Insert a necessary `goto` statement in the first branch of the new penalty routine within *build\_page*. §997 B

**30 Sep 1978**

- 338 → **353** Make the token list for runaway arguments meaningful outside of *macro\_call*. (I just had a runaway argument ending with ‘\lcm’, which turned out to be the control sequence in hashtable location 0.) §371 M
- 354** Avoid infinite loop when recovering from `$$` in restricted horizontal mode. §1138 R
- 355** Fix two hyphenation bugs related to `-ages`, `-ers`. [A completely new algorithm for hyphenation will go into  $\text{\TeX}$ 82.] L
- 356** Add `-est` to hyphenation routine; also disable `puz-zled` and `rat-tled`, etc. Q

**4 Oct 1978**

- 357** Add new primitive `\vtop`. §1087 G
- 358** Treat implicit kerns properly after discretionary hyphens have been inserted. §914 Q

**4 Nov 1978**

- 359** Forget the half quad originally required at left and right when centering displayed equations without equation numbers. §1202 Q

**11 Nov 1978**

- 360** Don't let the postamble come out empty. [This could occur if no fonts were selected.] §642 R

**15 Nov 1978**

- 361** Allow optional space after digit in *scan\_int* routine. §444 C

**17 Nov 1978**

- 362** Make the *check\_mem* procedure slightly more robust. §167 R

**20 Nov 1978**

- 363** Make the `\par` in a `\def` match the `\par` that comes automatically with a blank line. (Suggested by Terry Winograd.) §351 C
- 364** Add new parameter `\mathsurround` for spacing before and after math in text. §1196 G
- 365** Extend `\advance` to allow increase by other than unity. [At this time it applies only to the ten `\count` registers, and it is called `\advcount`.] §1238 G

**25 Nov 1978**

- 366** Add a new primitive: `\unskip`. §1105 G
- 367** Add new primitives `\uppercase` and `\lowercase`. §1288 G

**28 Nov 1978**

- 338** → **368** Don't let `\mark` and *macro.call* interfere with each other's *scanner\_status*. §306 M
- 369** Omit extra `}` after *show\_node\_list* shows a `\mark`, since the right brace is already there. (See #210.) §176 M
- 370** Add a new primitive suggested by Terry Winograd: `\xdef`. §1218 G

**29 Nov 1978**

- 371** Delete a space following `\else{...}` also in the false case. [T<sub>E</sub>X78 uses braces, not `\fi`, for conditionals.] S
- 320** → **372** Make `\tracing` set `\showboxbreadth` as advertised. §198 D
- 373** Account properly for kerns in width calculations of *line\_break*. §866 F
- 364** → **374** Delete a *math\_node* at the beginning of a line. §148 Q
- 339** → **375** Guarantee that `\predisplaypenalty=10000` will suppress page breaking before a display. §1005 A

**6 Dec 1978**

- 376** Change the file opening statement to allow lines up to 150 characters long. [System dependent.] L

**16 Jan 1979**

- 365** → **377** Initialize *negative* properly in the `\advance` routine with a `\count` as argument. §440 F

**20 Jan 1979**

- 378** Try to keep complex, buggy preambles of alignments from crashing the program. §789 R

**17 Feb 1979**

- 376** → **379** Give more detailed information when warning about a long line being broken. [System dependent; the buffer size in T<sub>E</sub>X78 is very limited.] I
- 380** Declare *p* local to *try\_break*, for the “rare” case code. [My original program included the following comment: “This case can arise only in weird circumstances due to changing line lengths, and the code may in fact never be executed.” Later Michael Plass will discover that variable line lengths require an entirely different algorithm, using *last\_special\_line*.] §847 L

**334** → **381** Don't omit the raggedness correction when the last line of paragraph has to shrink. [Obsolete in `TEX82`.] F

### 22 Feb 1979

**363** → **382** Don't forget to return from *get<sub>x</sub>token* after finding `\par`. §351 F

**383** Add a new parameter: `\lineskiplimit`. §679 Q

**384** Change the syntactic sugar: '`\hbox par`' replaces '`\hjust to ...{overfull}`'. [This vastly improves on the old idea (see #40), but there still is no internal vertical mode.] C

**385** Introduce new names `\hbox` and `\vbox` for `\hjust` and `\vjust`. §1071 C

**386** Add a new condition: `\ifpos`. [It will later be generalized to `\ifnum` and `\ifdim`.] §513 G

**387** Add `\vu` and `\varunit`. [`TEX82` will eventually allow arbitrary internal dimensions as units of measure.] §453 G

**312** → **388** Add an `em` unit. §455 G

**389** Legalize `\hbox spread` <negative dimension> [since *scan<sub>spec</sub>* no longer uses the sign as a flag]. §645 C

### 10 Mar 1979

**370** → **390** Make *scan<sub>toks</sub>* expand `\count` during `\xdef`. [This will change later when `\the` and `\number` are introduced.] §367 C

### 23 Mar 1979

**391** Put only 100000 pt stretch at the end of a paragraph instead of 10000000000 pt. [In `TEX78`, “infinite” glue is actually finite but large; in the language of `TEX82` we would say that `\parfillskip`, which is not yet user-settable, is being changed to be like `\hfil` instead of like `\hfill`.] §816 Q

**392** Treat the last line of a paragraph more consistently with the other lines (e.g., when `\hfil` appears in mid-paragraph), by effectively inserting *inf<sub>penalty</sub>* at the end. §816 Q

### 31 Mar 1979

**393** Ensure that penalty nodes aren't wiped out, in weird cases where breaks occur at penalties that normally disappear. §879 S

### 27 Apr 1979

**394** Correct the page number count when files begin with an empty page. [System dependent.] A

**395** Allow the *math<sub>code</sub>* table to be changeable via `\chcode`. [In `TEX82`, `\chcode` will split into `\mathcode` and `\catcode`.] §1232 G

**332** → **396** Don't accept 'e' after an error message if not inputting from a file. §84 I

### 29 May 1979

**397** Don't call *end<sub>file<sub>reading</sub></sub>* if you haven't already invoked *begin<sub>file<sub>reading</sub></sub>*; this could happen when trying to recover from an error in *start<sub>input</sub>*. §537 F

### 7 Jun 1979

**306** → **398** Be sure to eject two pages, when `\eject` comes just at the time another break is preferable (e.g., when the page has just become too full). §1005 A

### 27 Jun 1979

**354** → **399** Don't say 'You can't do that in math mode' when the user says '\$\$' in restricted horizontal mode! §1138 I

### 30 Jun 1979

**400** Add `wd`, `dp`, `ht` dimension units. §455 G

**307** → **401** Don't try the system area for file names whose area is explicitly indicated. §537 I

**1 Jul 1979**

402 Allow letters as (ASCII) numbers [without the ‘ marker introduced later]. §442 G

**2 Jul 1979**

403 Fix a `\gdef` bug: If the control sequence was never defined before [this later became the *restore\_zero* option], don’t remove it at group end. §282 F

**16 Jul 1979**

320 → 404 Update *show\_noad\_list* to be like *show\_node\_list*. [The two routines, originally separate, will be merged in T<sub>E</sub>X82.] §238 I

**18 Jul 1979**

405 Extend capacity from 32 fonts to 64 fonts if desired. §134 G

406 Add new *extra\_space* parameter to all text fonts (requested by Frances Yao). §558 Q

407 Make each *node\_noad* print properly in *show\_noad\_list*. §183 F

408 Make `\jpar` allow any break if it is 1000000 or more. [In T<sub>E</sub>X82, a `\tolerance` of 10000 or more allows any break.] §851 Q

**23 Jul 1979**

409 Introduce new primitives `\hfil`, `\vfil`, `\hfilneg`, `\vfilneg`. §1058 E

410 Add `\ifmmode`. §501 G

411 Add `\firstmark`. §1012, 1016 G

412 Allow break at leaders (horizontal mode only). §149 C

**25 Jul 1979**

213 → 413 Revise *error* so that online insertions work properly after end-of-file errors. §336 I

411 → 414 Change ‘if *first\_mark* ≠ 0’ to ‘if *first\_mark* ≥ 0’ [because −1 is used to indicate ‘not yet given a value’]. §1012 B

**28 Jul 1979**

370 → 415 Stop `\xdef` from expanding control sequences after `\def`’s. [This decision will be rescinded later, after several more years of experience with macro expansion will suggest better ways to cure the problem.] §366 C

416 Change symbolic printout for control symbols. [System dependent.] §49 I

308 → 417 Avoid linefeeds in the transcript file. [System dependent.] L

370 → 418 Expand `\topmark`, etc., in `\xdef`. §366 C

**4 Aug 1979**

413 → 419 Fix an error introduced recently: `\par` was suddenly omitted at end of page. [System dependent.] B

**11 Aug 1979**

420 Change error messages that use SAIL characters not in standard ASCII. §360 P

**28 Aug 1979**

411 → 421 Move the command ‘*first\_mark* ← −1’ from *vpackage* to *fire-up*. §1012 D

403 → 422 Correct a serious `\gdef` bug: Control sequences don’t obey a last-in-first-out discipline, so T<sub>E</sub>X loses things from the hash table when deleting a control sequence. §259 S

- To fix this, I either need to restrict T<sub>E</sub>X (so that `\gdef` can be used inside a group only for control sequences already defined on the outer level) or need to change the hash table algorithm. Although all applications of T<sub>E</sub>X known to me will agree to the former restriction, I’ve chosen the latter alternative, because it gives me a chance to improve the language: Control sequences of arbitrary length will now be recognized.

423 Make sure that *unsave* cannot call *eq\_destroy* with a value from the upper part of *eqtb*. §282 D

- *I noticed this long-standing bug while fixing #422. It had very low probability of causing damage (e.g., it required a certain field of a floating-point number to have a certain value), but it would have been devastating on the day it first showed up!*

### 29 Aug 1979

- 424 Call `eq_destroy` when a control sequence is `\gdef`'ed after being `\def`'ed. §283 F
- 418 → 425 Treat the first token consistently when `\topmark` and its cousins are expanded in `scan_toks`. §477 F
- *Now I've checked things pretty carefully and I think  $\TeX$  is "fully debugged."*

### 25 Jan 1980

- 338 → 426 Display runaway alignment preambles. §306 I
- 427 Introduce active characters (one-stroke control sequences). [I don't yet go all the way: The meanings of 'x' and '\x' have to be identical.] §344 G

### 7 Feb 1980

- 314 → 428 Fix a glaring omission: Op space `\>` was never implemented in math mode! §716 F

### 25 Feb 1980

- 429 Add a new dimension 'ex' (for units of xheight). §455 G

### 3 Mar 1980

- 427 → 430 Allow the control sequence `\:` to be redefined [it was the 'select font' operator]; this allows the character `:` to be active. [Obsolete.] C

### 23 Mar 1980

- *An extend- $\TeX$ -for-the-eighties party:*

- 431 Add a new `\copy` feature. §204 G
- 432 Add a new `\unbox` feature. §1110 G
- 433 Add a new `\open` feature [later `\openout`]. §1351 G
- 434 Add a new `\send` feature [later `\write`]. §1352 G
- 435 Add a new `\leqno` feature, requested by MDS. §1204 G
- 436 Add a new `\ifdimen` feature [later `\ifdim`]. §513 G
- 437 Make `\(space)` in vertical mode begin a paragraph. §1090 C
- 438 Add a new `\font` feature [replacing the silly previous convention that a font must be defined when it is first selected]. §1256 G
- 439 Add new `\parval` and `\codeval` features [later `\the` (whatever)]. §413 G
- 427 → 440 Don't let active characters gobble the following space. §344 C
- 208 → 441 Add a new parameter to govern amount of token list dumped. [Obsolete.] §295 G
- 442 Add a new `\linebreak` feature [later replaced by `\break`]. §831 G

### 25 Mar 1980

- *(Still working on the above, also thought of more.)*

- 443 Add a new `\mskip` feature. §716 G
- 444 Add a new `\newname` feature (soon changed to `\let`). §1221 G
- 430 → 445 Allow any control sequence to be redefined. §275 G
- 446 Send the output to the user's current file area, even when input comes from elsewhere. §532 I

### 27 Mar 1980

- 447 Compute the xheight for accents in math mode from family 1, not family 3. [Obsolete.] Q

### 28 Mar 1980

- 448 Increase minimum clearance between subscript and superscript. §759 Q

### 29 Mar 1980

- 222 → 449 When a display follows a display, the second should have the 'shortskip' glue. §1146 Q

**4 Apr 1980**

445 → 450 Look at current token meanings when trying to recognize `\tabskip` in alignment preambles. §782 A

**23 Apr 1980**

451 Estimate the length of printed output, for the new priority feature on our XGP device driver. [System dependent.] I

434 → 452 Break long `\send` lines into pieces so that the file can be read in again. [System dependent.] C

**19 May 1980**

182 → 453 Don't make `\left` and `\right` delimiters too large; they need to be only 90% of the enclosed size. [This eventually became `\delimiterfactor`.] §762 Q

**21 May 1980**

454 Add a new `\pagebreak` feature [later `\vadjust{\break}`]. §655 G

**13 Jun 1980**

- *Today I'm beginning to overhaul the line-breaking routine, and I'll also install miscellaneous goodies.*

455 Allow a radical sign to be in different font positions. §737 G

456 Clear empty tokenlists off input stacks to allow deeper recursions (suggested by Jim Boyce's macros for chess positions). §325 E

457 Make `\spaceskip` and `\parfillskip` changeable. §1228 G

458 Add a new parameter `\rfudge` (per request of Zippel) [later `\mag`]. §288 G

459 Add a new parameter `\loose` [later `\looseness`]; now parameters are allowed to take negative values. §875 G

460 Remove the variable *just-par*. [Obsolete; it was the *real* equivalent of an *integer*.] E

**14 Jun 1980**

461 Install new line-breaking routines, including `\parshape`. (These major changes are introduced as Michael Plass and I write our article.) §813 Q

462 Add a new parameter `\exhyf` [later `\exhyphenpenalty`]. §869 G

**16 Jun 1980**

444 → 463 Change conventions in *eqtb* so that glue is distinguishable from other equivalents. §275 S

444 → 464 Don't expand `\b` in `\xdef{\d\b{...}}` after `\let\d=\def`. [Obsolete.] A

444 → 465 Avoid creating dead storage when doing *unsave* in certain regions. §275 D

**17 Jun 1980**

466 Allow negative dimensions in rules. §138 C

**19 Jun 1980**

463 → 467 Make the new test for glue at the outer level of *show\_eqtb*. §252 B

**27 Jun 1980**

453 → 468 Don't let `\left` and `\right` become too small for big matrices. [This eventually became `\delimitershortfall`.] §762 Q

**3 Aug 1980**

469 Don't move extra-wide, numbered equations flush left unless they begin with glue. §1202 Q

**15 Sep 1980**

461 → 470 Say ' $\geq fz$ ' instead of ' $> fz$ ' in the pre-hyphenation routine; I'd forgotten my definition of *fz* [a variable used to test for a sequence of lowercase letters in the same font]. §897 M

395 → 471 Check the range of the index in `\chcode` before saving the old value. §1232 R

**18 Sep 1980**

- 457 → 472 Don't forget to increase the reference count to `\parfillskip`, or it will mysteriously vanish. §816 D

**19 Sep 1980**

- 412 → 473 Make leaders break like glue in both horizontal and vertical modes. §149 C
- 364 → 474 Make `\mathsurround` break properly at left and right end of lines. §879 Q

**13 Oct 1980**

- 461 → 475 Remove spurious overfull boxes generated when the looseness criterion fails. [Obsolete.] I
- 461 → 476 Redesign the iteration for looseness; breakpoints were not chosen optimally. §875 A
- 461 → 477 Avoid storing a lot of breakpoints when they are dominated by others. §836 E
- 366 → 478 Don't say '*cur\_node*' when you mean '*mem[cur\_node]*'. §1105 B
- 461 → 479 Prefer the oldest break to the youngest break when two break nodes have the same total demerits. §836 Q
- 461 → 480 Don't make badness too big for floating-point calculations, when forced to make an overfull box. [Obsolete.] L

**10 Dec 1980**

- 481 Make it impossible to get unmatched '}' in a delimited macro argument. §392 R
- 482 Add new `\topsep` and `\botsep` features. [These are T<sub>E</sub>X78's way to put space at the edge of inserts, replaced in T<sub>E</sub>X82 by the `\skip` register corresponding to an `\insert` class.] §1009 G

**6 Jan 1981**

- 483 Install new routines for reading the font metrics, using Ramshaw's TFM files instead of TFX files. §539 P
- 484 Abort after reporting 100 errors, if not pausing on errors. §82 I
- 485 Add new `\spacefactor` and `\specskip` and `\skip` primitives. [At this time we write '`\specskip3=10pt`' and '`\skip3`' for what will become '`\skip3=10pt`' and '`\hskip\skip3`' in T<sub>E</sub>X82.] §1060 G
- 366 → 486 `\unskip` is now allowed in internal vertical mode. §1105 G

**26 Jan 1981**

- 482 → 487 Don't say '*mem[q]*' when you mean '*q*'. (See #143 and #478.) §1009 B

**27 Feb 1981**

- 417 → 488 Put some linefeeds back into the transcript file, in order to prevent overprinting in listings. [System dependent.] I
- 489 Add a new `\dpenalty` feature [later `\postdisplaypenalty`]. §1205 G
- 490 Add the dimension `cc` for European users. §458 G
- 491 Make `scan_keyword` match uppercase letters as alternatives to lowercase ones (suggested by Barbara Beeton's experiments with `\uppercase`). §407 C
- 492 Add nonstop mode so that overnight batch processing is possible. §73 I

**2 Mar 1981**

- 422 → 493 Fix a still more serious `\gdef` bug: The generality of `\gdef` almost makes it a crime to forget *any* control sequence names, ever! (The previous bug was only the tip of an iceberg.) §259 S
- 494 Issue warning message at the end of a file page if nesting level isn't zero. [System dependent.] I

**5 Mar 1981**

- 495 Keep track of maximum memory usage, for statistical reporting. [Obsolete.] §125 I
- 350 → 496 Prune away glue and penalties at top of page after marks, sends, inserts. §1000 Q
- 497 Allow `\mark` in horizontal mode. [Later it will be `\vadjust{\mark...}`.] §655 G



498 Allow optional space before a required left brace, e.g., `\if AA {...}`. [See #251.] §403 C

499 Issue an incomplete `\if` error, to help catch a bad `\if`. §336 I

### 17 Mar 1981

494 → 500 Omit the warning message at end of a file page unless the nesting level has changed on that page. [System dependent.] I

310 → 501 Fix the spacing when there is a very tall subscript with a superscript. §759 Q

### 20 Mar 1981

371 → 502 Make space-eating after `\else` fully consistent between the true and false cases. [Obsolete.] S

### 24 Mar 1981

496 → 503 Change *glue\_spec\_size* to *ins\_spec\_size* in *vpackage* [where insertions are done]. [Obsolete.] B

### 5 Apr 1981

501 → 504 Fix a typo ('+' instead of '-') in the new subscript code; this shifted certain subscripts down instead of up. §759 B

### 18 Apr 1981

505 Make leaders with rules of specified size act like variable rules. §626, 635 G

### 29 Apr 1981

461 → 506 Don't consider *badness* > *threshold* at a line `\break` except in an emergency. §854 A

### 13 Jul 1981

402 → 507 Allow other characters as numbers. §442 C

294 → 508 Avoid dead storage if a *no\_new\_control\_sequence* error occurs. [Obsolete.] §259 R

509 Add a new `\ifx` feature. §507 G

510 Add new features `\xleaders` and `\cleaders`. §626, 635 G

### 14 Jul 1981

507 → 511 Amend the new code for constants; the '.' in '.5' is thought to mean '056!' §442 S

507 → 512 And fix an egregious blunder in that code: New commands at the end of a procedure are ignored when earlier statements exit via `return`. §442 L

### 4 Aug 1981

513 Accept alphabetic codes for all online error recovery options, instead of insisting on control codes like line feed or form feed. [The original error-recovery codes were suggested by the conventions of the SAIL compiler.] §84 P

514 Add a new `\thebox` feature [later `\lastbox`]. §1079 G

### 7 Aug 1981

515 Add `fil`, `fill`, and `filll` as units for glue stretching or shrinking. §454 G

516 Suppress the overfull box error when shrinkage amount is negative. §664 I

### 9 Aug 1981

517 Let unset boxes inherit the size of their parent in alignments. §810 Q

### 12 Apr 1982

518 Make INITEX dump out the *font\_dsize* array needed by the new DVI output module. §1322 F

### 1 May 1982

151 → 519 Fix *clean\_box* so that *mlist\_to\_hlist* cannot make *link*(*q*) = 0 and *type*(*q*) = *glue\_node*. §720 S

- [That was the historic final change to T<sub>E</sub>X78. All subsequent entries in this log refer to T<sub>E</sub>X82.]

## 15 Jul 1982

- Finished draft of test program and began debugging about 1430 [2:30 pm].  
Taking my time.
- X1 Change *eqtb[*cur\_font*]* to *eqtb[*cur\_font\_loc*]*. §232 B
  - Not logging changes to the exposition.
  - Compile time is about 2 minutes CPU, times 5 for time-sharing; add another half minute for linking and loading.
  - Hash table and *get\_next* seem to be working, with no changes needed!
  - Time out 1630–1815 for Jill’s birthday party.
- X2 Insert **begin** ... **end** around *dump\_int* macro. §1305 L
- X3 Print two blank spaces before date in *open\_log\_file*. §536 I
- X4 Update *x* and *var\_used* outside the **for** loop. §1311 A
- X5 Change **if** = to **if** ≠ as loop exit condition. §1315, 1316 B
  - The TRIP test should preload more fonts.
- X6 Insert **begin** ... **end** around statistics output. §1334 L
- X7 Must *get\_x\_token* when scanning a number. §445 F
- X8 Interactive *debug\_help* needs to print a newline. §1338 I
- X9 Include *ignore\_spaces* and *math\_accent* in *print\_cmd\_char* cases. §266 F
- X10 Don’t call *confusion* when *print\_cmd\_char* sees unknown code. §298 I
  - Compiler bug causes stack overflow. Retiring for the night at 2145.

## 16 Jul 1982

- Starting at 0700; DRF has fixed the compiler.
- X11 Allow arbitrary integer parameters in diagnostic print routines. §237, 699 R
- X12 Say *cur\_tok*, not *cur\_val*, when you mean *cur\_tok*. §440 T
- X13 Make **\pause** effective also on first line of a file. §538 F
- X14 Show context after online deletion. §88 F
- X15 Bypass reference count when *debug\_help* shows a token list. §1339 I
- X16 Change ‘*case p*’ to ‘*case type(p)*’. §1000 B
- X17 Fix timing of *print\_ln* when scrolling help messages. §90 F
- X18 Make *other\_char* the default category for ASCII control codes too. §232 P
- X19 Use special scanning method for font number in *new\_font*. §1257 A
  - Eating lunch, 1020–1035, while the machine slowly recompiles everything.
- X20 Don’t forget to increase *k* in the **while** loop. §355 F
- X21 Adjust *limit* properly after line changed when pausing. §363 D
- X22 Remember to return a value in *new\_spec* and *new\_penalty*. §151, 158 F
  - Now stepping through *line\_break* in simple case.
- X23 Don’t prune unwanted nodes if *cur\_p* = *null*. §877 A
- X24 Print a closing parenthesis when displaying glue nodes. §189 F
- X25 Use *last*, not *limit*, in *term\_input*; else error prompt causes trouble when  
*state* = *token\_list*. §71, 87 S
- X26 Set *first* ← *limit* + 1 after *init\_terminal*. §331 D
- X27 Make sure *set\_trick\_count* is always performed. §317 D

## 17 Jul 1982

- X28 Add new diagnostic feature **\tracingcommands**. §299, 1031 I
  - Debugging of system-dependent code not shown in this log.
  - Tangling T<sub>E</sub>X now takes 1.75 minutes; about 75K bytes, 108K tokens.
  - Redundant semicolon sends Pascal compiler into infinite loop!
- X29 Initialize *passive* ← *null*. §864 F
- X30 Fix pseudoprinting when the line is empty. §318 A
- X31 Merge adjacent free areas of dynamic memory before dumping. §131 E
- X32 Print the word **mode** in *print\_mode*. §211 F

<b>X33</b>	Improve message and help in case of weird error.	§415	I
<b>X34</b>	Allow optional space after <code>\def</code> and similar constructions.	§473	G
<b>X35</b>	Declare <i>alpha</i> to be integer in <i>read_font_info</i> .	§560	M
<b>X36</b>	Fix timing of <i>back_input</i> in <i>scan_dimen</i> .	§448	A
<b>X37</b>	Back up after missing number error.	§446	I
<b>X38</b>	Show the ‘at’ size that is considered improper.	§1259	I
<b>X39</b>	Streamline the dialog in <i>debug_help</i> .	§1338	I
<b>X40</b>	Take output of <i>the_toks</i> from the advertised place.	§467, 1297	M
<b>X41</b>	Say <i>trie_fix</i> ( <i>q</i> ), not <i>trie_fix</i> ( <i>p</i> ).	§959	T
<b>X42</b>	Decrease low limit of <i>error_count</i> to $-1$ .	§76	S

### 18 Jul 1982

<b>X43</b>	Clear initial reference count of macro definitions.	§473	F
<b>X44</b>	Fix timing of <i>back_input</i> in <i>scan_glue</i> .	§461	A
<b>X45</b>	Use <i>cur_val_level</i> , not <i>cur_val</i> , when checking levels.	§461	B
<b>X46</b>	Multiply <i>fil</i> units by $2^{16}$ for correct scaling.	§454	B
<b>X47</b>	Don’t confuse <i>glue_base</i> with <i>skip_base</i> .	§1237	B
<b>X48</b>	Fix <i>print_scaled</i> so that 0.01 doesn’t come out 0.1.	§103	A
<b>X28</b> → <b>X49</b>	Show mode changes when tracing commands.	§299	I
<b>X50</b>	Don’t say <code>if (n = 0) ∨ (... div n)</code> in Pascal.	§105	L
<b>X51</b>	Don’t confuse <i>box_flag</i> with <i>box_code</i> .	§1075	B
<b>X52</b>	Reset <i>offset</i> on <i>print_ln</i> even in <i>no_print</i> mode.	§57	S
<b>X53</b>	Fix restarting of interrupts after <i>big_switch</i> .	§1031	S
<b>X54</b>	Don’t loop <code>for k ← a to b − 1</code> when $b = 0$ if $k$ is declared nonnegative.		L
<b>X55</b>	Put ‘=’ sign into the <i>format_ident</i> .	§1328	I
<b>X56</b>	Allow $r$ to be any integer in <i>get_node</i> .	§125	S
<b>X57</b>	Don’t put the output of <i>print_file_name</i> in quotes.	§518	I
<b>X58</b>	Say ‘dumped’ after dumping.	§1311	I
<b>X59</b>	Eliminate unnecessary initialization code.	§1332	E
<b>X60</b>	Get the file reading started right when beginning to undump.	§1308	L
<b>X61</b>	Give forlorn message if format file can’t be loaded.	§1303	I
<b>X62</b>	Assign value to <i>cur_val</i> after glue arithmetic.	§1239, 1240	F

### 19 Jul 1982

<b>X63</b>	Don’t say <code>if p &gt; max ∨ free[p]</code> in Pascal.	§169	L
<b>X64</b>	Fix memory-undump logic; loops are out of phase with input.	§1312	A
<b>X65</b>	Undump <i>hyph_word</i> [ $j$ ], not <i>hyph_word</i> [ $k$ ].	§1325	B
	• At last <i>trip_fmt</i> loads without bombing out.		
<b>X66</b>	Remove assignment of array to array, not allowed by IBM Pascal (Susan Plass).	§167	P
<b>X67</b>	Simplify an expression that’s too big for IBM Pascal (Susan Plass).	§1009	P
<b>X68</b>	Go to <i>contribute</i> , not <i>done</i> , after insertions.	§1000	A
<b>X69</b>	Decrease <i>depth_threshold</i> if there’s not enough string space.	§198	I
<b>X70</b>	Show rules as ‘l’ in short displays.	§175	I
<b>X71</b>	Don’t show null glue in short displays.	§175	I
<b>X72</b>	Set <i>job_name</i> ← 0 as part of output initialization.	§528	S
<b>X73</b>	Don’t complain of infinite shrinkage on <code>Opt minus Ofil</code> .	§825, 976, 1009	S
<b>X74</b>	Use different prompt at beginning when accepting a file name.	§37	I
<b>X75</b>	Reset <i>last_glue</i> on nonglue nodes.	§996	F
<b>X76</b>	Remember to call <i>error</i> after printing OK.	§1293	B
<b>X77</b>	Insert <code>begin ... end</code> around program text of section.	§1025	L
<b>X78</b>	Define the <code>\shipout</code> primitive.	§1071, 1073	F
<b>X79</b>	Introduce <i>write_loc</i> analogous to <i>par_loc</i> .	§1344, 1371	A
<b>X80</b>	Dump and undump <i>par_loc</i> and <i>write_loc</i> .	§1313, 1314	F

- X81** Allow *the* in *scan\_the* [later *scan\_something\_internal*]. §413 F
- X82** Interchange command codes *the* := *number* [later *convert*]. §210 E
- X83** Don't confuse *breadth* with *depth*. §236 B
- X84** Add string printing feature to *debug\_help*. §1339 I
- X85** Set *state*  $\leftarrow$  *mid\_line* in *begin\_file\_reading*. §328 F
- Time out 2105–2200 to pick up Jenny from driving lesson.
- X86** Keep  $c \leq 127$  when deleting 99 tokens. §88 L
- X87** Don't check for *str\_room* error when *selector* = *new\_string*. §1328 S

## 21 Jul 1982

- X88** Gather more statistics: String usage, font info, hyphen exceptions, stacks. §1334 I
- X79**  $\mapsto$  **X89** Initialize *write\_loc* from *cur\_val*, not from *cs\_ptr*. §1344 D
- X90** Remember to pack file name for  $\backslash$ **open**. §1374 F
- X34**  $\mapsto$  **X91** Defuse  $\backslash$ **outer** test before scanning optional space after '}'. §473 S
- X92** Don't allow *prepare\_mag* to cause errors after *jump\_out*. §84 S
- The first page of DVI output is perfect! Pause to play piano.
- X93** Don't confuse *dimen\_base* with *scaled\_base*. §1237 B
- X94** Initialize *link(page\_head)*  $\leftarrow$  *null* when beginning a page. §991 D
- X95** Correct *cur\_height* more often, since *max\_depth* might be negative. §972, 973 S
- X96** Calculate page dimensions properly after vertical kerns. §973 A
- X97** Install new *page\_contents* logic to handle interaction between insertions and  $\backslash$ **topskip**. §987, 1008 S
- X98** Allow *top\_skip* glue to be a valid breakpoint. §1001 S
- X99** Don't forget to count *dyn\_used* in inner loop [erroneous analysis retracted later]. §1034 F
- X100** Set  $p \leftarrow q$  after migration step. §655 F
- X101** Clear *prev\_graf* to zero at start of paragraph. §1091 F
- X102** Put parens into negated *leader\_flag* macro. §1078 L
- Time out 1720–1920 for John's birthday dinner.
- X103** Scale *best\_height* when adjusting *page\_goal*. §1010 D
- X104** Simplify logic of split insertions; three states become two. §981, 1019, 1020 A
- X105** Don't omit first character when showing a macro argument. §400 M
- X106** Prevent clobberage if macros have too many parameters. §390 R

## 22 Jul 1982

- X107** Tell how many DVI bytes were output. §642 I
- X88**  $\mapsto$  **X108** Adjust for singular or plural statistics. §1320, 1334 I
- X98**  $\mapsto$  **X109** Consider *page\_head* a glue node, to inhibit unwanted break. §988 S
- X110** Introduce *new\_skip\_param* to keep reference counts updated. §679, 969, 1001 D
- X111** Record the correct size of new insertion after it's split. §1010 D
- X112** Use *free\_node*, not *flush\_node\_list*, when recycling insertion nodes. §1022 D
- X113** Make online insertions work after *get\_next* is interrupted. §87, 324, 343 S
- X114** Print newline on interruption stop. §98 B
- X34**  $\mapsto$  **X115** Put space before *end\_write\_token*. §1371 S
- X116** Don't confuse *glue\_order* with *stretch\_order*. §838 B
- X117** Set *max\_dimen*  $\leftarrow$  '????????', not '????????'. §421 T
- X118** Make  $\backslash$ **global** $\backslash$ **textfont** legal. §1211 M
- X119** Fetch  $\backslash$ **the** $\backslash$ **textfont** with *equiv*, not *fam\_font*. §415 B
- X120** Call *new\_ligature*(*f*, *l*, ...) not (*f*, *c*, ...). §1035 B
- X121** Make *show\_box* work on random garbage. §174, 177 R
- X122** Count reference to *zero\_glue* from *cond\_math\_glue*. §1171 D

## 23 Jul 1982

- X123** Allow *avail* = *null* when undumping. §1312 R
- X110** → **X124** Set *width(glue\_ptr(p))*, not *width(p)*. §679 B
- X125** Put *begin\_file\_reading* inside the *start\_input* loop. §537 A
- X116** → **X126** Don't confuse *glue\_stretch* with *stretch\_order* [the previous fix went only half-way]. §838 B
- X127** Negate *x* when calculating badness of shrinkage. §667, 678 B
- X121** → **X128** Remove dangling **else** that parses wrong. §174 L
- X28** → **X129** Print newline before {, not after }, when tracing commands. §299 I
- X130** Remove colon from overfull box messages. §663, 675 I
- X97** → **X131** Compute *page\_goal* properly when the first box arrives after inserts. §1001 D
- X132** Don't confuse *page\_size* [now *page\_goal*] with *best\_size*. §1017 B
- X133** Put heldover insertions at front of contribution list. §1023 A
- X88** → **X134** Output stats before closing DVI file, since the latter decreases *font\_ptr*. §1333 S
- X135** Don't call a \vbox an \hbox. §674 T
- X136** Fix misplaced **end** caused by editing error. §675 T

## 24 Jul 1982

- X137** Don't *eq\_destroy* any paragraph shape when *par\_shape* is null. §275 D
- X138** Omit blank before \message at the beginning of a line. §1280 I
- X104** → **X139** Don't try to split an insertion when *best\_node* isn't the split one. §1021 A
- X140** Correct another case of 'if  $x \wedge y$ ' misunderstood by Pascal. §1021 L
- X141** Provide diagnostic info about insertions via \showlists. §986 I
- X142** Add 'inside a group' to clarify a warning message. §1335 I
- X143** Report *prev\_depth* on a separate line in \showlists. §219 I
- X144** Back up input to avoid unexpected clobberage of *cur\_tok*. §1090 S
- Wow what a bug: *new\_graf* calls *build\_page*, which invokes the output routine, after which 'goto reswitch' is a disaster.
- X145** Add insertion glue to *page\_so\_far* instead of subtracting it from the goal. §1009 D
- X146** Put extra blank line before overfull box warning. §660 I
- X147** Define break at kern consistently between horizontal and vertical lists. §973, 1000 C
- X148** Renumber so that math nodes are nondiscardable. §147 D
- X149** Correct the *char\_kern* macro: #, not *f*. §557 T
- X150** Decrease *l* after reconstituting discretionary break. §916 F
- X151** Simplify the hyphen routine, knowing that *link(s)* = *null*. §918 E
- X152** Initialize  $r \leftarrow q$  in discretionary destruction routine. §883 F

## 25 Jul 1982

- X153** Don't add interline penalty after last line of paragraph. §890 A
- X154** Adjust spacing in diagnostic messages. §245 I
- X155** Avoid simultaneous use of *temp\_head* by *prune\_page\_top* and the page builder. §1017 D
- X156** Clear the *post\_break* field of simple discretionaries. §916 F
- X157** Split *offset* into independent variables *term\_offset*, *file\_offset*. §54, 57, 58 A
- Am freezing current program as version -0.25; a week of TUG lectures begins tomorrow.

## 5 Aug 1982

- X158** The '.err' file should be '.log' instead. §534 I
- X159** Allow \special strings to contain more than 256 bytes. §585, 1368 G
- X99** → **X160** Undo "correction" to a non-bug. §1034 M
- X161** Suggest \& in help message for unexpected &. §1128 I
- X162** Make 'E' a standard option for exiting. §84 G
- X163** Restore the use of dead cycles à la T<sub>E</sub>X78. §1024, 1054 G
- The previous six changes were suggested during discussions with T<sub>E</sub>X82 class.

- X164 Fix global variable conflict between *open\_log\_file* and *new\_font*. §1257 S
- X165 Allow optional '=' when assign to font parameter. §1253 C
- X166 Set *cur\_val* after increasing the number of font parameters. §580 F
- X167 Set *hash\_brace* when matching '{'. §476 D
- X88 → X168 Clarify meaning of statistics printed. §1334 I
- X169 Change DVI format to include design size. §602, 1260 G
- X170 Introduce *def\_ref* for *runaway* messages. §306 D
- X171 Restore *cur\_cs* before calling *scan\_toks*. §1226 M
- X157 → X172 Update *print\_nl* to dual offset conventions. §62 A
- X163 → X173 Move endgame logic inside *main\_control*, because the output routine becomes active. §1054 A

### 6 Aug 1982

- X174 Allow INITEX to load format files. §1337 C
- X175 Conserve input stack space by deleting finished token lists. §325 E
- X74 → X176 Print the opening '\*\*' in the transcript file. §534 I
- *Now ready to try breaking new ground in TRIP.*
- X177 Preserve *align\_state* from tokens deleted online. §88 S
- X178 Set *t* in all branches of *scan\_toks*. §473 D
- X179 Change '*cur\_cmd* ≤ *right\_brace*' to '*cur\_tok* ≤ *right\_brace\_limit*'; otherwise *\relax* gets through. §477 S
- X180 Allow optional = when setting *\spacefactor*; disallow zero. §1243 C
- X181 Change *vpackage(head)* to *vpackage(link(head))*. §796 B
- *Shades of 1978!*
- X182 Insert missing **begin ... end**. §798 L

### 7 Aug 1982

- X183 Keep *trie\_max* declared in non-INITEX [later rescinded]. §950 L
- X184 Watch out for empty token list when copying. §466 D
- X185 Free unused reference count slot when defining *\everypar*. §1226 D
- X163 → X186 Introduce *\maxdeadcycles*. §1012 G
- *I believe the line\_break routine has passed its test perfectly.*
- X187 Don't put discretionary after - inside a discretionary. §1039 S
- X188 Change '*\minus*' to '*\minusthe*' [this feature retracted later]. §413 C
- X189 Change *cur\_p* to *r* (three places). §875 B
- X190 Increase range of *hc* to *halfword*; otherwise end-of-word mark might match a vacant entry in the trie. §892 A
- X191 Initialize *b* in *shift\_case* routine. §1288 F
- X192 Don't back up if a space follows a decimal fraction. §452 E
- X193 Don't confuse *glue\_base* with *dimen\_base*. §1145 B
- X194 Guard against anomalous floating-point values in glue display. §186 L

### 8 Aug 1982

- X195 Avoid infinite loop when *\outer* leads to runaways. §339 S
- *I worked on that problem about two hours before fixing it.*
- X196 Move final *debug\_help* to *succumb*, except in batch mode. §93 I
- X197 Insert kern after spanned box, to defeat access to floating point. §808 R

### 9 Aug 1982

- X198 Include *\leftskip* and *\rightskip* in displayed equations [rescinded later]. §1199 C
- X199 Trace line-break computations if *tracing\_stats* > 2. §846, 856 I
- X200 Keep *prev\_p* up to date when passing a string. §867 D
- *Now stepping through math stuff; a lot is working.*
- X201 Set *link(p)* ← *z* when making a fraction. §747 D
- X202 Don't reset space factor when beginning *\valign*. §775 C

<b>X203</b>	Don't show glue setting if <i>glue_sign</i> = <i>normal</i> .	§186	I
<b>X204</b>	Clear <i>glue_stretch</i> and <i>glue_shrink</i> when creating an unset box.	§801	D
<b>X205</b>	Do <i>vpack</i> in <i>hmode</i> and vice versa when aligning.	§804	B
<b>X206</b>	Remove fallacious call to <i>confusion</i> after alignment in display.	§1206	A
<b>X207</b>	Don't test <i>mode</i> = <i>vmode</i> in display, test <i>nest_ptr</i> = 1.	§1145	A
<b>X208</b>	Show an <i>inner_noad</i> as well as the other types.	§690, 696	F
<b>X209</b>	Renumber <i>mu_glue</i> and <i>cond_math_glue</i> so that the glue display logic works.	§149	D
<b>X210</b>	Don't confuse <i>cur_size</i> with <i>cur_style</i> .	§703	B
<b>X211</b>	Advance $p \leftarrow q$ during second pass over <i>mlist</i> .	§761	F
<b>X212</b>	Add helpful hint about <code>\tracingonline=1</code> .	§1293	I
<b>X213</b>	Delete spurious statement left from sloppy editing.	§710	T
<b>X214</b>	Change the subtype when <i>mskip</i> becomes <i>hskip</i> .	§732	D
<b>X215</b>	Don't forget to use the remainder when computing math glue.	§716	F
<b>X199</b> $\mapsto$ <b>X216</b>	Improve paragraph diagnostics using <i>short_display</i> .	§857	I
<b>X199</b> $\mapsto$ <b>X217</b>	Introduce <i>artificial_badness</i> for better diagnostics.	§854, 856	I

### 11 Aug 1982

<b>X218</b>	Introduce <i>char_box</i> subroutine so that <i>var_delimiter</i> adds italic correction.	§709	A
<b>X219</b>	Save font and char in local variables of <i>make_math_accent</i> , since it can be recursive.	§738	S
<b>X220</b>	Call <i>error</i> after decrying an invalid character.	§346	F

### 12 Aug 1982

<b>X199</b> $\mapsto$ <b>X221</b>	Install new format for showing break nodes.	§846	I
	• <i>I have been testing line.break and I think it's working fine.</i>		
<b>X222</b>	Change $q$ to $p$ , in order to catch empty alignments.	§812, 1206	B
<b>X223</b>	Disallow third part of discretionary in math mode.	§1120	S
<b>X224</b>	Don't change <i>tail</i> if discretionary third part is empty.	§1120	D
<b>X225</b>	Say <i>nonscript</i> , not <i>non_script</i> .	§189	I
<b>X226</b>	Inhibit math if <code>\scriptfont3</code> is improper.	§1195	S
<b>X199</b> $\mapsto$ <b>X227</b>	Introduce <code>@firstpass</code> and <code>@secondpass</code> comments.	§863	I
<b>X228</b>	Change $p$ to $r$ when you mean $r$ .	§1204	T
<b>X108</b> $\mapsto$ <b>X229</b>	Say <i>page</i> , not <i>pages</i> , if there's only 1.	§642	I
<b>X230</b>	Insert space before <code>[]</code> on truncated <code>\showlists</code> .	§182	I

### 28 Aug 1982

	• <i>Back from vacation after having looked at hardcopy listing of TRIP test.</i>		
<b>X231</b>	Allow <i>dm</i> as a unit [later <code>.5dm1</code> will be <code>.5\dimen1</code> ].	§455	G
<b>X108</b> $\mapsto$ <b>X232</b>	Singularize <code>prevgraf 1 lines</code> .	§219	I
<b>X233</b>	Omit trailing zero count registers when showing completed page numbers.	§638	I
<b>X234</b>	Avoid clobbering $a$ by introducing a new local variable $t$ .	§986	L
<b>X216</b> $\mapsto$ <b>X235</b>	Fix diagnostic printing of discretionaryaries.	§858	D
<b>X236</b>	Don't show unset stretch/shrink that's zero.	§185	I
<b>X198</b> $\mapsto$ <b>X237</b>	Make <code>\halign</code> in displays consistent with other displays. (Namely, ignore <code>\leftskip</code> and <code>\rightskip</code> in nonaligned displays; respect the paragraph shape in aligned displays.)	§800, 1199	C
<b>X238</b>	Parenthesize 'If you're confused ...'.	§403	I
<b>X239</b>	Say ' <code>\fraction</code> ', not ' <code>\xabovex</code> '.	§697	I
<b>X240</b>	Remember to <b>return</b> when you should.	§1153	F
<b>X241</b>	Use absolute value to make sure <b>div</b> is unambiguous.	§737	P
<b>X218</b> $\mapsto$ <b>X242</b>	Don't confuse depth with height.	§709	B
<b>X243</b>	Use <i>delta - height</i> , not <i>height - delta</i> .	§736	B
<b>X244</b>	Increase <i>shift_down</i> to increase the clearance.	§745	B
<b>X245</b>	Don't back up after improper use of <code>\the</code> .	§428	I



- X246** Don't give `0pt` as the default result when looking for `tok_val`. §428 I
- X247** Initialize `second_indent` in the easy case. §848 F
- X248** Package the equation number. §1204 F
- X249** Don't resort to  $v \leftarrow \text{max\_dimen}$  when glue doesn't stretch or shrink. §1148 Q
- X250** Insert newline before showing current `\botmark`. I
- X251** Call `error` after giving error message. §784 F
- X252** Change implementation of `\number`; it should `scan_int`, not something internal. §471 A
- X253** Introduce symbolic constants like `format_area_length`. §524 P
- X254** Change `quit` to `jump_out`, since some compilers treat `quit` as a reserved word. §81 P
- X255** Add more parentheses to get proper parsing. §1260 L
- X256** Say `please` in order to be friendly (or at least polite). §360 I
- X257** Don't confuse `cur_vcmd` with `cur_chr`. §508 B
- X258** Use `&` instead of `!` to specify a preloaded format. §1337 I
- X177** → **X259** Correct `s3` to `s4`. §88 T
- X260** Introduce new primitive `\mathchardef`, to save space and time. §1224 G
- X261** Use the `[]` convention for noads as well as nodes. §692 C
- X262** Correct spelling in call to `primitive`: `\xatopx` should be `\xoverx` [later renamed, thank goodness]. §1178 T

### 30 Aug 1982

- X263** Don't fetch `link(null)` in malformed list. §175 R
- X264** Initialize `align_state` at a better time so that `align_peek` doesn't see `&` or `\span`. §785, 791 S
- X265** Outlaw preamble interfering with `align_state = 0`. §789 S
- X266** Add level of grouping to alignment to tabskip locality. §774 C
- X267** Check `align_state` when scanning  $\langle u_j \rangle$ . §783 F
- X268** Move '`unsave; new_save_level`' from `main_control` into `fin_col`. §791, 1131 A
- X180** → **X269** Remember `cur_chr` when you're looking for optional '='. §1243 S
- X270** Change `q` to `r` [in code now obsolete]. §804 T
- X271** Disable interrupts during `back_error` so that help messages aren't clobbered. §327 I
- X272** Introduce `slow_print` for printing control sequences. §60 S
- X273** Initialize `del_code(".")` ← 0 for error recovery. §240 I
- X274** Call `end_file_reading` before calling `check_outer_validity`. §362 S
- X275** Don't delete an extra '`}`' when `\par` will help find a runaway. §395 I

### 31 Aug 1982

- X276** Don't confuse `thin_muskip` with `thin_muskip_code`. §413 B
- X266** → **X277** Recover from error if new `align_group` ends abnormally. §1132 F
- X278** Recover from error if `\par` occurs when `align_state < 0`. §1094 I
- X279** Make `\hskip\the\thinmuskip` and `\mskip\the\baselineskip` erroneous. §413 C
- X280** Add `\muskip` and `\setmuskip` analogs to `skip` and `\setskip`. §413, 1228 G
- X281** Don't output `pop` right after `push`. §601 E
- The TRIP test looks right; now to test for wasted memory.
  - When memory should be empty I find `dyn_used = 18`, `var_used = 267`.

### 1 Sep 1982

- Made special MEMTEX program, designed to track all memory allocation.
- X282** Delete reference to `last_glue` when a page is packaged. §1017 D
- X283** Include `save_stack` in the `search_mem` debugging routine. §285 I
- X284** Disallow `\vfill` in restricted horizontal mode. §1095 C
- Most of the memory locations I thought were wasted were actually in good use.
  - Total 192 hours (approx) debugging time so far since July 15.

## 2 Sep 1982

- *Now looking at all zero counts in profile and extending TRIP.*
- X285 Simplify the creation of `vtop` boxes. §1087 E
- X286 Set `space_factor`  $\leftarrow$  1000 after `\hbox`. §1076 C
- X287 Introduce preamble into DVI format. §617 P
- X288 Give special `chr_code` to `\relax`. §265 S
- X289 Don't show '(null)' when token list is null, just show nothing. §295 I
- X290 Delete the procedure `write_name_string`, which is never used. E
- X291 Rename `\xabove` to `\abovewithdelims`; do the same for `\xatopx` and `\xoverx`. §1178 C
- X292 Improve `clean_box` so that it recognizes cleanliness better. §720 Q
- X293 Report a `Missing delimiter` more meaningfully. §1161 I
- X294 Give `endv_token` a `chr` code of 128 so that it will end a file name. §289 R
- X295 Test present of math fonts *after* parsing an `mlist`, not before. §1138, 1195 R
- X296 Omit 'recent contributions' and/or 'current page' when they are empty. §218, 986 I
- X297 Display what T<sub>E</sub>X has deleted after improper discretionary list has arisen. §1121 I
- X298 Show what math character was undefined. §723 I
- X299 Improve the `Incompatible magnification` error; break it into two lines. §288 I
- X300 Put new cases into `flush_node_list`, to recycle `mlist` noads. §698 D

## 6 Sep 1982

- X300  $\mapsto$  X301 Insert a necessary 'goto done' in that new material. §698 F
  - *It took two hours to diagnose that goto problem.*
- X295  $\mapsto$  X302 Change '2' to '3' in help message for extension fonts. §1195 T
- X303 Add a special note if material is being held over for the next output. §986 I
- X304 Divide before multiplying in `make_left_right`, to avoid overflow. §762 R
- X305 Introduce the `box_error` routine. §992 I
- X306 Clear `arith_error` after overflow has been reported. §460 F
- X249  $\mapsto$  X307 Don't confuse `stretch` with `glue_stretch`. §1148 B
- X308 Set `glue_sign`  $\leftarrow$  `normal` when packaging with glue ratio zero. §558, 664 D
- X309 Test for overflow before attaching the sign. §448 A
  - *That all worked! Now trying min\_quarterword negative.*
- X310 Take absolute value before applying `mod` in `new_trie_op`. §944 L
- X311 Say  $q_i(c)$ , not  $c$ , when testing TFM flags [now obsolete]. §573 L
- X312 Initialize `token_ref_count(def_ref)` to `null`, not zero. §473 L
- X313 Change the type of `vsplit` parameter  $n$  from `quarterword` to `eight_bits`. §977 L
- X314 Initialize `null_delimiter` different from `null_character`. §685 L
- X315 Insert  $q_i$  twice in `scan_delimiter`. §1160 L
- X316 Insert  $q_i$  in `scan_math`. §1151 F
- X317 Insert  $q_o$  in `fetch`. §722, 723 F
- X318 Insert  $q_i$  in `set_math_char`. §1155 F
- X319 Insert  $q_i$  in `math_ac`. §1165 F
- X320 Insert  $q_o$  in `mlist_to_hlist`. §755 F
- X321 Use brackets around 8-bit characters in `print_ASCII`. §68 I
- X322 Include `hyph_list` in the `search_mem` debugging routine. §933 I
  - *Now compiling non-INITEX to try an industrial-strength version.*
- X323 Add `return` to `final_cleanup`, because some Pascal compilers insist that each label be used. §1335 L
- X324 Compute `par_token` when undumping. §1314 D

**11 Sep 1982**

- X325** Emit newline before file name, if near end of line. §537 I  
**X326** Define `\ifx` for arbitrary tokens. §507 C

**12 Sep 1982**

- X327** Don't ask users to type `x` twice before exiting. §84 I  
**X328** Install new features `\openin`, `\read`, `\ifeof`, `\closein`; rename existing `\open`,  
`\send`, `\close` to be `\openout`, `\write`, `\closeout`. §209, 313, 1275 G  
**X329** Install new feature `\expandafter`. §368 G  
**X330** Change the default file area from '`<TeX>`' to '`TeXinputs:`'. §574 P

**13 Sep 1982**

- X331** Install new feature `\string`. §472 G  
**X332** Remove spurious space printed by `sprint_cs`. §263 A  
  - *All tests passed now! But when I played with the system I found another bug (undetected by TRIP):***X333** Set  $r \leftarrow s$  after matching macro parameter tokens. §397 F

**16 Sep 1982**

- X199**  $\mapsto$  **X334** Introduce serial numbers in line-break records, improving readability and independence. §846 I  
**X335** Don't abort when `file_name_size` is exceeded. §519 I

**17 Sep 1982**

- X336** Remove unwanted period from font capacity message. §567 I

**18 Sep 1982**

- X329**  $\mapsto$  **X337** Make `\expandafter` more powerful by moving it from semantics to syntax [i.e., from stomach to mouth]. §368 G

**19 Sep 1982**

- X338** Improve error recovery for 'Missing number'. §415 I

**22 Sep 1982**

- X339** Suppress italic correction between letters in math mode except in math fonts. §752 Q

**24 Sep 1982**

- X340** Define `null = mem_bot`, not `min_halfword`, because there's a reference to `link(null)` in `try_break`. §115 P  
**X341** Initialize `str_start[0]  $\leftarrow$  0`. §47 D  
**X342** Avoid blank space at beginning of line. §638 I  
**X343** Set type of new box in math mode to `ord_noad`, not `inner_noad`. §1076 D

**28 Sep 1982**

- *Here are the first changes made to the preliminary listing of T<sub>E</sub>X82 that was published by the T<sub>E</sub>X project earlier this month.*
- 520** Insert the missing cases *letter* and *other\_char* after *x\_token* looks ahead. §1038 F  
**521** Change '`\pause`' to '`\pausing`'. §236 C  
**522** Reset *overfull\_rule* when determining tabskip glue. §804 D  
**523** Fix the logic for scanning `\ifcase` [in obsolete syntax—everything is still done with braces since '`\fi`' doesn't exist yet]. §509 A

**30 Sep 1982**

- 524** Change "`0.0`" to "`?.`" (suggested by DRF). §186 I

**2 Oct 1982**

- 525** Use conditional thin spacing next to 'Inner' noads. §764 Q  
**526** Make thick spaces conditional. §766 Q

**4 Oct 1982**

- 527** Increase *trie\_size* from 7000 to 8000, because of Frank Liang's improved (but longer) hyphenation patterns. §11 P

**6 Oct 1982**

- X330** → **528** Change the string lengths to match the new *T<sub>E</sub>X\_format\_default*. §520 F
- *Version 0 of T<sub>E</sub>X is being released today!*

**8 Oct 1982**

- 529** Fix a blunder: I decreased *h* mod a quarterword when it should have been decreased mod *trie\_op\_hash\_size* (HWT). §944 B

**9 Oct 1982**

- X258** → **530** Fix a typo ('!' not '&') in the WEB documentation. §524 P
- 531** Remember to call *initialize* if a different format was preloaded (Max Díaz). §1337 F
- *Version 0.1 incorporates the above changes.*

**12 Oct 1982**

- 532** Add the '*\immediate*' feature, by popular request. §1375 G
- *Version 0.2 incorporates this (somewhat extensive) change.*

**13 Oct 1982**

- 533** Introduce new WEB macros so that *glue\_ratio* is more easily changed. §109 P
- *I began writing The T<sub>E</sub>Xbook today: edited the old preface and searched in the library for quotations.*

**14 Oct 1982**

- 534** Change the type of *hd* to *eight.bits*; it's not a *quarterword* (HWT). §649 B
- X281** → **535** Revise the optimization of DVI commands: It's not always safe to eliminate *pop* when the preceding byte is *push*, since DVI commands have variable length! (Embarrassing oversight caught by DRF.) §601 S

**15 Oct 1982**

- 536** Test '*prev\_depth > ignore\_depth*', not '*≠*'. §679 C
- *Version 0.3 incorporates the above changes.*

**16 Oct 1982**

- 537** Omit definition of *align\_size*; it's never used (Bill Scherlis). §11 P
- 538** Inhibit error messages when packaging box 255. §1017 I

**21 Oct 1982**

- X145** → **539** Subtract *width(q)* from *page\_goal*, don't add it to *page\_so\_far*[1]. §1009 A
- *Version 0.4 incorporates the above changes.*

**22 Oct 1982**

- 540** Increase the amount of lower (variable-size) memory from 12000 to 13000, since the T<sub>E</sub>X program listing now needs about 11500. [At this time there still is a fixed boundary between upper and lower memory.] §12 P
- 541** Add a new parameter *\boxmaxdepth*. §1086 G
- *Version 0.5 incorporates the above changes.*

**26 Oct 1982**

- 542** Fix an off-by-one error caught by Gabi Kuper and HWT. (I forgot '*+ 1*'). §1317 B
- 543** Fix the spacing of displayed control sequences: *print\_cs* should base its decision on *cat\_code(p - single\_base)*, not *cat\_code(p)*. §262 B
- *The TRIP test detected this bug, but I didn't notice.*

**27 Oct 1982**

- 544** Set *math\_type* before saying *fetch(nucleus(q))*, since fetching can have a side effect. §752 S

**28 Oct 1982**

- 545 Install a major change: Fonts now have identifiers instead of code letters. Eliminate the ‘\:’ primitive, and give corresponding new features to ‘\the’. §209 G
- *Actually I began making these changes on October 26, but I needed two days to debug them and to put Humpty Dumpty together again.*
  - *At this time I’m also drafting macros for typesetting The T<sub>E</sub>Xbook.*
  - *The above changes have been incorporated into Version 0.6.*

**30 Oct 1982**

- *After years of searching, I’ve finally found a definitive definition of the printer’s point; and (unfortunately) my previous conjecture was wrong. The truth is that 83 pc = 35 cm, exactly; so I am changing T<sub>E</sub>X to conform.*
- 546 Revise unit definitions for the ‘real’ printer’s point. §458, 617 C
- *Version 0.7 incorporates the above.*

**1 Nov 1982**

- *Oops! Retract error #546, and retract T<sub>E</sub>X Version 0.7; the source of my information about points was flaky after all. My original suppositions were correct, as confirmed by NBS Circular 570.*

**4 Nov 1982**

- 547 Revise the definition of `dd`, conforming to the definitive value shown me by Chuck Bigelow. §458 C
- 545 → 548 Introduce “frozen” copies of font identifiers, to be returned by `\the\font`, so that font manipulation is more robust. §1257 R

**5 Nov 1982**

- 549 Reset *looseness* and paragraph shape when beginning a `\vbox`. §1083 D

**6 Nov 1982**

- 550 De-update *align\_state* when braces are in constants. §442 D
- X294 → 551 Improve error recovery for bad alignments. §1127 I
- *Today I wrapped up Chapters 4 and 5.*

**8 Nov 1982**

- 552 Give more power to `\let`: the right-hand side needn’t be a control sequence. §1221 G
- 553 Amend *show\_context* to say ‘(*base\_ptr* = *input\_ptr*) ∨ ’; otherwise undefined control sequences can be invisible in unusual cases (John Hobby). §312 I
- 554 Compute demerits more suitably by adding a penalty squared, instead of adding penalties before squaring. §859 A
- *Previously a slightly loose hyphenated line followed by a decent line was considered worse than a decent hyphenated line followed by a quite loose line.*

**10 Nov 1982**

- 555 Save a bit of buffer space by declaring *pool\_file* only in INITEX. §50 E

**11 Nov 1982**

- 556 Introduce a new context indicator to clarify T<sub>E</sub>X’s scanning state: A special type called *backed\_up* is distinguished from other kinds of *inserted* lists; it is called ‘recently read’ or ‘to be read again’, while others are called ‘inserted’. §314 I
- 557 Append a comment, ‘*treated as zero*’, to the missing-number message. §446 I
- 558 Ignore the settings of `\hfuzz` or `\vfuzz` if `\hbadness` or `\vbadness` is less than 100. §666, 677 I

**13 Nov 1982**

- *Major surgery on the program is planned for today, because of new ideas suggested by correspondence with MDS and other macro writers.*
- 559 Introduce a new `\tokens` register; this will be useful and easy to add, since T<sub>E</sub>X already can handle `\everypar` and `\output`. §1227 G

- X34** → **560** Change *get\_x.token* to *get\_token* when scanning an optional space; then a construction like `\def\foo{...}\foo` won't complain that `\foo` is undefined. §443 C
- *This change was retracted when it was being debugged, because it could cause `endv` to abort the job. Then it was re-established again when I found that `endv` needed to be more robust anyway. [But it was eventually rescinded again.]*
- 561** Make `\span` mean 'expand' in a preamble. §782 G
- 562** Use three separate `if` tests instead of '`^`' in the inner loop of *get\_next*, to gain efficiency. §342 E
- 563** Introduce *get\_r.token* so that assignments have uniform error messages and so that frozen equivalents cannot be changed. §1215 R
- *I gave a few variables more mnemonic names as I made these changes.*
- 564** Move conditional statements from the semantics ('stomach') part of T<sub>E</sub>X to the syntax ('mouth') part, by introducing '`\fi`'. Also introduce `\csname` and `\endcsname`. §372, 489–500 C
- *This makes macros much more predictable and logical, but it is by far the most drastic change ever made to T<sub>E</sub>X. The program began to come back to life only after three days of solid hacking.*
  - *Several other things were cleaned up as part of this change because it is now more natural to handle them differently. For example, a null control sequence has now become more logical.*
  - *The result of all this is called Version 0.8.*
- 18 Nov 1982**
- *Today I resumed writing Chapter 8. Tomorrow I'm 2<sup>14</sup> days old!*
- 21 Nov 1982**
- 565** Declare *c* as a local variable for hyphenation (DRF). §912 F
- 566** Omit the "first pass" and try hyphenations immediately, if `\pretolerance` is negative (suggested by DRF). §863 E
- 567** Don't ship out incredibly huge pages; they might foul up DVI files. §641 R
- 2 Dec 1982**
- 568** Add new features `\everymath` and `\everydisplay`. §1139, 1145 G
- 569** Add a new feature `\futurelet`. §1221 G
- *The changes above have been incorporated into Version 0.9 of T<sub>E</sub>X.*
- 7 Dec 1982**
- 570** Add a new `\endinput` primitive (suggested by FY). §362, 378 G
- 8 Dec 1982**
- 571** Try *off\_save*, if `\par` occurs in restricted horizontal mode. (This avoids embarrassment if T<sub>E</sub>X says 'type a command or say `\end`', then when you type `\end` it says you can't!) [However, I soon retracted this change.] §1094 I
- 21 Dec 1982**
- 572** Redefine `\relax` so that its *chr* field exceeds 127. (This facilitates the test for end in *scan\_file\_name*.) §265 A
- 566** → **573** Call *begin\_diagnostic* when omitting the first pass of line breaking. §863 F
- 574** Fix the logic of glue scanning: In `\hskip-1pt plus2pt` the minus should apply only to the 1pt. §461 A

## 23 Dec 1982

- 575** Renumber the decimal codes in paragraph statistics for loose and tight lines; they were ordered backwards. §817 I
- 576** Treat a paragraph that ends with leaders like a paragraph that ends with glue. §816 C
- 577** Allow commas as alternates to radix points, for Europeans. §438 C

- 578** Change `\hangindent` to a normal dimension parameter. [It had been a combination of `\hangindent` and `\hangafter`, with special syntax.] §247 C
- 579** Make `\prevgraf` accessible to users. §422, 1244 G
- 580** Split `\clubpenalty` off from `\widowpenalty`. §890 G
- *I'm typing Chapter 14 while making these changes.*

#### 24 Dec 1982

- 581** Use *backinput* instead of *goto reswitch* when inserting `\par`, because `\par` may have changed. §1095 S

#### 25 Dec 1982

- *It's 10pm after a very Merry Christmas!*
- X328 → **582** Don't prompt for a new file name if `\openin` doesn't find a file. §1275 I
- 583** Add a new `\jobname` primitive. §472 G
- 584** Give the user a way to delete the dollar sign, when  $\TeX$  decides to insert one. §1047 I
- 585** Allow optional equals after `\parshape`, and implement `\the\parshape`. §423, 1248 C

#### 26 Dec 1982

- 586** Add an *if\_line\_field* to the condition stack entries, so that more informative error messages can be given. §489 I
- 549 → **587** Introduce a *normal\_paragraph* procedure, since initialization is needed also within `\insert`, `\vadjust`, `\valign`, `\output`. §1070 D

#### 27 Dec 1982

- 588** Give users access to `\pagetotal` and `\pagegoal`. (Analogous to #679 and #585, but simpler.) §1245 G
- X199 → **589** Introduce `\tracingpages`, allowing users to see page-optimization calculations. Also split `\tracingparagraphs` off from `\tracingstats`. §987, 1005, 1011 I
- *The changes above have been incorporated into Version 0.91 of  $\TeX$ .*

#### 31 Dec 1982

- 590** Break the *build\_page* procedure into two parts, by extracting the section now called *fire\_up*. [This is necessary because some Pascal compilers, notably for IBM mainframes, cannot deal with large procedures.] §1012 P
- 564 → **591** Make `\ifodd1\else` legal by introducing *if\_code*. §489 S
- 592** Improve alignments when columns don't occur: Don't append null boxes for columns missing before `\cr`, and zero out the tabskip glue after nonpresent columns. §802 Q
- 593** Make the error message about overfull alignment more intelligible. §801, 804 I
- *The changes above have been incorporated into Version 0.92 of  $\TeX$ 82, which was the last version of 1982, completed at 11:59pm on December 31.*

#### 3 Jan 1983

- *Today I'm beginning to write Chapter 15, and planning the `\output` routine of `plain.tex`.*
- X186 → **594** Change the logic of *its\_all\_over*; use *max\_dead\_cycles* here too, instead of the fixed constant 100. §1054 C
- X34 → **595** Don't forget to *pop\_nest* when an insert is empty. Also disallow optional space after `\insert n { ... }`. §1100 F

#### 4 Jan 1983

- 541 → **596** Use the `\boxmaxdepth` that's declared inside a `\vbox` when packaging it. §1086 C
- 597** Rename `\groupbegin` and `\groupend` as `\begingroup` and `\endgroup`. §265 C
- 594 → **598** Make `\deadcycles` accessible to users. §1246 G
- 599** Base the split insertions on natural height plus depth, not on *delta*. §1010 Q
- *The changes above have been incorporated into Version 0.93.*



**6 Jan 1983**

- 600 Add *push\_math* to handle a case where I forgot to clear *incomplete\_noad*. (This long-standing bug was unearthed today by Phyllis Winkler.) §1136 D
- 588 → 601 Add `\pageshrink`, etc., too. §1245 G
- 602 Introduce new parameters `\floatingpenalty`, `\insertpenalties`. Also adopt a new internal representation of insertion nodes, so that `\floatingpenalty`, `\splittopskip` and `\splitmaxdepth` can be stored with each insertion. §140, 1008 G

**7 Jan 1983**

- 603 Improve the rules for entering *new\_line*, in particular when the end-of-line character is active. §343 Q

**9 Jan 1983**

- 604 Distinguish between implicit and explicit kerns. §155, 896 Q
- 605 Change the name `\ignorespace` to `\ignorespaces`. §265 C
- 560 → 606 Don't omit a blank space after `\def`, `\message`, `\mark`, etc.; the previous hodgepodge of rules is impossible to learn. §473 C
- *The above changes appear in Version 0.94.*

**12 Jan 1983**

- *Beginning to write the chapters on math today.*
- 607 Add a new feature: active characters in math mode. §1151 G

**15 Jan 1983**

- 608 Fix a surprise bug: '\$1-\$' treated the - as binary. §729 A
- 609 Initialize *space\_factor* inside discretionaries. §1117 D

**16 Jan 1983**

- 610 Fix an incredibly embarrassing bug: I forgot to update *spotless* in the *error* routine! F
- *While fixing this, I decided to change *spotless* to a more general *history* variable, as suggested by IBMers who want a return code.* §76, 82, 1335
- 611 Replace two calls of *confusion* by attempts at error recovery, in places where 'This can't happen' could actually happen. §1027, 1372 I

**18 Jan 1983**

- 612 Introduce the *normalize\_selector* routine to protect against startup anomalies when the transcript file isn't open. Also make *open\_log\_file* terminate in some cases. §92, 535 R
- 591 → 613 Insert `\relax`, not a blank space, to cure infinite loop like `\ifeof\fi` (LL). §510 R
- 614 Change the old `\limitswitch` to `\limits`, `\nolimits`, and `\displaylimits`. Incidentally, this fixes a bug in the former positioning of integral signs. §682, 749 G
- 615 Give a `\char` in math mode its inherited `\mathcode`. §1151 C
- 525 → 616 Make underline, overline, radical, vcenter, accent noads and {...} all revert to type Ord instead of type Inner. Introduce a new primitive `\mathinner`. (This fixes the spacing, which got worse in some ways after change #525.) §761 Q
- *I'm working on Appendix G today.*

**19 Jan 1983**

- 617 Introduce a `\mathchoice` primitive. §1174 G
- 618 Move `\input` from the stomach to the mouth. §378 C
- X260 → 619 Introduce `\chardef`, analogous to `\mathchardef`. §1038, 1224 C
- 620 Change `\unbox` to `\unhbox` and `\unvbox`; also add `\unhcopy`. §1110 G
- 621 Consider `\spacefactor`, `\pagetotal`, etc., as part of *prefixed\_command*, even though they are always global. §1211 C

**20 Jan 1983**

**622** Switch modes when `\hrule` occurs in horizontal mode or `\vrule` in vertical.

§1090, 1094 C

**623** Add a new `\globaldefs` feature.

§1211 G

**21 Jan 1983**

**624** Optimize the code, in places where it's important (based on frequency counts of T<sub>E</sub>X usage accumulated during the past week): Introduce *fast\_get\_avail* and *fast\_store\_new\_token*; reduce procedure-call overhead in *begin\_token\_list*, *end\_token\_list*, *back\_input*, *flush\_node\_list*; change some tests from 'if *a* ∧ *b*' to 'if *a* then if *b*'.

§122, 371 E

**22 Jan 1983**

**625** Save space in math lists: Don't insert penalties within restricted horizontal mode; simplify trivial boxes.

§721, 1196 E

**626** Fix a surprising oversight in the *rebox* routine: Ensure that *b* isn't a vbox.

§715 S

545 → **627** Make `\nullfont` a primitive, so that *cur\_font* always has a value. (This is a dramatic improvement over T<sub>E</sub>X78, where a missing font was a fatal error called 'Whoa'!)

§552 C

**24 Jan 1983**

586 → **628** List all incomplete `\if`'s when the job ends.

§1335 I

**29 Jan 1983**

552 → **629** Change initialization of *align\_state* so that `\halign\bgroup` works.

§777 C

**30 Jan 1983**

625 → **630** Be sure to test '*is\_char\_node(q)*' when checking for a trivial box.

§721 D

- *By extraordinary coincidence, this bug was caught when somebody used font number 11 (= kern\_node) in the second character of a list of length 2!*

X168 → **631** Improve format for stats at end of run, as suggested by DRF.

§1334 I

- *The changes above have been incorporated into Version 0.95.*

**632** Don't ignore the space after a control symbol (except '`\`').

§354 C

**633** Remove all trailing spaces at the right of input lines, so that there's perfect compatibility with IBM systems that extend short lines with spaces.

§31 P

**3 Feb 1983**

**634** Assume that a *math\_accent* was intended, after giving an error message in the case *mmode* + *accent*.

§1165 I

**635** Add new primitives `\iftrue` and `\iffalse`.

§488 G

**6 Feb 1983**

X304 → **636** Improve the accuracy of fixed-point arithmetic when calculating sizes for `\left` and `\right`. (I had started by dividing *delimiter\_factor*, not *delta1*, by 500.)

§762 A

**12 Feb 1983**

**637** Change the name `\delimiterlimit` to `\delimitershortfall`.

§248 C

**638** Make `\abovewithdelims..` equivalent to `\above`; change the order of operands so that delimiters precede the dimension.

§1182 C

607 → **639** Remove the kludgy math codes introduced earlier; make `\fam` a normal integer parameter and allow `\mathcode` to equal 2<sup>15</sup>.

§1233 C

**640** Don't let `\spacefactor` become more than 2<sup>15</sup>.

§1233, 1243 R

- *I finished drafting Chapter 17 today.*

**14 Feb 1983**

639 → **641** Replace octal output (*print\_octal*) by hexadecimal (*print\_hex*) so that math codes are clearer.

§67 I

619 → **642** Don't forget *char\_given* in the *math\_accent* routine.

§1124 F

**17 Feb 1983**

- 622** → **643** Switch modes when `\halign` occurs in horizontal mode, or `\valign` in vertical mode. §1090, 1094 C

**18 Feb 1983**

- 644** Add a new feature `\tracingrestores`. This requires a new procedure called `show_eqtb`, whose code can be interspersed with the `eqtb` definitions. §252 I

**25 Feb 1983**

- 622** → **645** Suggest using `\leaders` when the user tries a horizontal rule in restricted horizontal mode. §1095 I

**27 Feb 1983**

- 646** Specify the range of source lines, when giving warning messages for underfull or overfull boxes in alignments. §662, 675 I
- *Why did it take me all day to type the middle part of Chapter 18?*

**4 Mar 1983**

- 647** Introduce a new feature `\xcr` (suggested by LL). [Changed later to `\crrcr`.] §785 G
- 631** → **648** Subtract out T<sub>E</sub>X's own string requirements from the stats. §1334 I

**6 Mar 1983**

- 649** Add new features `\everyhbox` and `\everyvbox`. §1083, 1167 G

**9 Mar 1983**

- X295** → **650** Avoid accessing `math_quad` when the symbol fonts aren't known to be present. §1199 R
- 533** → **651** Introduce `float` and `unfloat` macros to aid portability (HWT). §109 P
- 652** Introduce new names `\abovedisplayskip` and `\belowdisplayskip` for the old `\dispskip`; also `\abovedisplayshortskip` and `\belowdisplayshortskip` for the old `\dispaskip` and `\dispskip`. §226 C

**10 Mar 1983**

- 653** Unbundle `\romannumeral` from `\number` (suggested by FY). §468 C

**12 Mar 1983**

- 654** Ignore leading spaces in `scan_keyword`. §407 C

**14 Mar 1983**

- 631** → **655** Use `write` and `write_in` directly when printing stats. §1334 E

**16 Mar 1983**

- 602** → **656** Refine the page-break cost function (introducing '*deplorable*', which is not quite '*awful-bad*'), after suggestion by LL. §974, 1005 Q
- *The changes above have been incorporated into Version 0.96.*

**18 Mar 1983**

- 657** Add a new feature `\everyjob` suggested by FY. §1030 G

**19 Mar 1983**

- 658** Don't treat left braces specially when showing macros. §294 I
- 659** Ignore blanks that would otherwise become un delimited arguments. §393 C

**21 Mar 1983**

- X280** → **660** Make `\lastskip` handle `mu_glue` as well as ordinary glue. §424 F
- 561** → **661** Expand only one level in a preamble `\span`. §782 C

**22 Mar 1983**

- 662** Let a single `#` suffice in `\tokens`, `\message`, etc. (The previous rule, in which `##` was always required as in macros, was a loser especially in `\write` where you had to say `####!`) §477 C

**X328** → **663** Require the keyword ‘to’ in `\read`. (This will avoid the common error of an incomplete constant when no space appears before the `\cs`.) Also allow terminal I/O as a default when a stream number is out of range. §482, 1225, 1370 C

#### 26 Mar 1983

**664** Replace `\ifeven`(countnumber) by `\ifodd`(number), for better consistency of language. §504 C

**564** → **665** Introduce the *change\_if\_limit*, to overcome a big surprise bug relating to `\if\if aabc\fi`. §497 S

- *Such examples show that cur-if might not be current, in my original implementation.*

#### 28 Mar 1983

**X326** → **666** Tolerate non-characters as arguments to `\if` and `\ifcat`. §506 G

**667** Change ‘absent’ to ‘void’, a better word. §487 C

**668** Clear the *shift\_amount* in `\lastbox`, since I don’t want to figure out what it means in all cases. §1081 C

#### 29 Mar 1983

**669** Wake up the terminal before giving an error message. (This means a special *print\_err* procedure is introduced.) (Suggested by DRF.) §34, 73 I

#### 1 Apr 1983

- *Today I finished Chapter 21 (boxes) and began to draft Chapter 22 (alignments).*

**670** Allow periodic preambles in alignments. §793 G

**671** Make `\leaders` line up according to the smallest enclosing box. §627, 636 C

**672** Allow hyphenation after whatsits (e.g., after items for an index). §896 Q

#### 2 Apr 1983

**673** Call *build\_page* when `\par` occurs in vertical mode. §1094 Q

**674** Clear *aux* in *init\_row*, for tidyness. §786 C

#### 4 Apr 1983

**675** Let digits switch families in math mode. §232 C

#### 7 Apr 1983

**602** → **676** Refine the test for not splitting an insertion. §1008 Q

#### 8 Apr 1983

**647** → **677** Rename `\xcr` as `\crrc`, at LL’s request. §780 C

#### 9 Apr 1983

- *Took a day off and had a chance to help print a sample page on a 150-year-old letterpress in Murphys, California.*

#### 11 Apr 1983

**678** Recover more sensibly after a runaway preamble. §339 I

#### 12 Apr 1983

**X328** → **679** Make `\read` span several input lines, if necessary to get balanced braces. §482 C

#### 14 Apr 1983

**680** Fix a subtle bug found by JS: §882 can make *q* a *char\_node*, so we need to test ‘if  $\neg is\_char\_node(q)$ ’. [Actually I discovered much later that the real bug was to omit ‘else’ at this point.] §881 S

#### 15 Apr 1983

**681** Make `\uppercase` and `\lowercase` apply to all characters, regardless of category. §1289 C

- 7:30am. After working all night, I completed a draft of the manual thru Chapter 22, for distribution to volunteer readers.
- 5pm. The changes above have been incorporated into Version 0.97.

**17 Apr 1983**

- 682** Change ‘*small\_number*’ to ‘0..65’ in the hyphenation routine (DRF). §901 R
- 683** Flush patterns in the input when the user tries `\patterns` outside of INITEX (suggested by DRF). §1252 I
- *Tomorrow I fly to England, where I’ll lecture and write a paper about ‘Literate Programming’ [Comp. J. 27 (1984), 97–111].*

**14 May 1983**

- 663** → **684** Improve the behavior of `\read` from terminal (suggested by Todd Allen at Yale). [I’d forgotten to implement the extended stream numbers in #663. Also, the prompt is now omitted if  $n < 0$ .] §484 I

**18 May 1983**

- 685** Restrict `\write n` to the transcript file only, if  $n < 0$ . §1350 I
- X188** → **686** Unify the syntax for registers and internal quantities. (Remove primitives called ‘*insthe*’ and ‘*minusthe*’; rename *scan.the* to *scan.something.internal*, and change its interface accordingly; clean up command codes generally.) §209, 413 C
- 687** Introduce new parameters `\hoffset`, `\voffset`. §617 G

**24 May 1983**

- 688** Introduce a new parameter `\everycr` (suggested by MDS). §774, 799 G
- *Many macro writers and preliminary-manual readers have been requesting new features; I’ll try to keep the language as concise and consistent as possible.*

**25 May 1983**

- 689** Introduce `\countdef`, `\dimendef`, etc. (suggested by DRF long ago, easy now in view of #686). §1224 G
- 690** Introduce `\advance`, `\multiply`, `\divide` (suggested by FY). §1240 G
- 691** Introduce `\hyphenchar`; this requires a new command *assign\_font\_int*, plus minor changes to about 15 modules. §915 G
- 692** Introduce `\skewchar` (easy because of #691). §741 G
- 693** Introduce `\noexpand`. (I had difficulty thinking of how to implement this one!) §358, 369 G
- 694** Introduce `\meaning`. §296 G
- X231** → **695** Remove ‘*dm*’ and ‘*vu*’; allow the more general ‘.5\hsize’. §455 G
- 696** Change ‘`\texinfo f n`’ to ‘`\fontdimen n f`’. §578 C

**27 May 1983**

- 697** Add a new feature `\afterassignment` (suggested by ARK). §1269 G
- 619** → **698** Adjust the timing so that commands like ‘`\chardef\xx=5\xx`’ behave sensibly. §1224 C

**28 May 1983**

- 699** Ignore ‘*relax*’ as if it were a space, in math mode and in a few other places where *relax* would otherwise be erroneous. §404 C
- 700** Improve `\mathaccent` spacing with respect to subscripts and superscripts (suggested by HWT). §742 Q

**30 May 1983**

- 598** → **701** Terminate a job only when *dead\_cycles* = 0. §1054 C
- *The changes above constitute Version 0.98.*

**3 Jun 1983**

- *I finished the draft of Chapter 23 (output routines) today.*

- 702** Allow `\mark` and `\insert` and `\vadjust` in restricted horizontal mode, and also in math mode. (This is a comparatively big change, triggered by the fact that `\mark` in a display presently causes  $\mathrm{T\!E\!X}$  to crash with ‘`This can’t happen!`’) The global variable *adjust.tail* is introduced. §796, 888, 1085 G

### 6 Jun 1983

- 695 → **703** Replace (and generalize) the previous uses of `ht`, `wd`, and `dp` in dimensions by introducing the new control sequences `\ht`, `\wd`, and `\dp`. §1247 G
- 704** Display sub-parts of noads with the symbols `^` and `_` instead of `(` and `[`. §696 I
- 694 → **705** Allow `A..F` in hex constants to be *other\_char* as well as *letter*. §445 C

### 7 Jun 1983

- 654 → **706** Remove an instance of `<Scan optional space>`, since it’s now redundant. §457 E
- 707** Legalize `\mkern\thinmuskip` and `\mkern5\thinmuskip`. §456 C
- 708** Clean up the treatment of optional spaces in numerical specifications. §455 C
- A construction like `2.5\space\space\dimen0` was previously valid after ‘`plus`’ or ‘`minus`’ only!
  - I’m obviously working on Chapter 24 today.
- 545 → **709** Allow ‘`\font`’ as a `<font identifier>` for the current font. §577 C
- 623 → **710** Don’t make `\gdef` global when *global.defs* < 0. §1218 C
- 711** Produce *zero\_glue* as the outcome of `\advance\spaceskip by-\spaceskip`. §1229 E
- 712** Make `\show` do something appropriate for every possible token. §1294 I
- 559 → **713** Replace the (single) `\tokens` parameter by an array of 256 token registers. §230 G
- 714** Allow `\indent` in math mode; also make `\align` in math mode produce the ‘`Missing $`’ error. §1046, 1093 C
- 715** Remove redundant code: There’s no need to check *cur\_group* or call *off\_save* when starting alignments or equation numbers in displays. §1130, 1142 E

### 8 Jun 1983

- 716** Disallow `\openout-1` and `\closeout-1`. §1350 C
- 717** Disallow `\lastbox` in math mode. §1080 C

### 9 Jun 1983

- 718** Call *back\_error*, not *error*, when `\leaders` aren’t followed by proper glue. §1078 I
- 719** Initialize for a possible paragraph, after `\noalign` in a `\valign`. §785 D

### 10 Jun 1983

- 708 → **720** Expand the optional space after an ASCII constant. §442 C

### 12 Jun 1983

- 721** Set *space\_factor* ← 1000 after a rule or a constructed accent. §1056, 1123 C

### 14 Jun 1983

- 722** Correct a serious blunder: Set *disc\_width* ← 0 before testing if *s* is null (caught by JS). §869 D
- This is a real bug that existed since the beginning! It showed up on page 37 of the Version 0 TRIP manual, but I didn’t notice the problem.
- 708 → **723** Make optional spaces after `<dimen>` like those after `<number>`. §448 C
- 568 → **724** Insert *every\_display* before calling *build\_page*. §1145 C
- 648 → **725** Report  $\mathrm{T\!E\!X}$ ’s capacity on overflow errors in a way that’s fully consistent with other statistical reports. §42 I

### 17 Jun 1983

- 726** Make all `\tracing` decisions on the basis of  $\geq$  versus  $<$ , not  $\neq$  versus  $=$ . §581 C
- Today I finished the draft of Chapter 27 (the last chapter)!
  - The changes above were released as Version 0.99 on June 19, 1983.

**20 Jun 1983**

- 727** Set `\catcode'\%=14` in INITEX. §232 C
- 587 → **728** Call *normal\_paragraph* when `\par` occurs in vertical mode. §1094 C
- *Once again I'm retiring about 8am and awaking about 4pm.*

**21 Jun 1983**

- 558 → **729** Don't append an overfull rule solely because of `\hbadness`. §666 C
- 730** Don't allow the glue-ratio of shrinking to be less than  $-1$ . §810, 811 R

**22 Jun 1983**

- 653 → **731** Declare the parameter to *print\_roman\_int* to be of type *integer*, instead of *nonnegative\_integer* (found by Debby Clark). §69 B
- 690 → **732** Make the keyword 'by' optional (suggested by LL). §1236 C

**24 Jun 1983**

- 733** Say 'preloaded' when announcing *format.ident*. §1328 I

**25 Jun 1983**

- 734** Add extra boxes and glue to the output of alignment. [This thwarts possible attempts at trickery by which system-dependent glue set values computed by `\span` could have gotten into T<sub>E</sub>X's registers by things like `\valign` and `\vsplit`. It also has the advantage of perfect accuracy in alignment of vertical rules.] §809 R
- 735** Make leaders affect the height or width of the enclosing boxes. §656, 671 C
- *Today I'm mainly installing a much-improved format for change files in WEB programs (suggested by DRF).*

**28 Jun 1983**

- 736** Permit `\unskip` in vertical mode when we know that it does nothing. §1106 C

**1 Jul 1983**

- 700 → **737** Avoid redundant boxes when things like `{\bf A}` occur in math. §1186 E
- 738** Add a 'scaled' feature to `\font` input. §1258 G
- 700 → **739** Remember to correct *delta* when an accented box changes. §742 D

**2 Jul 1983**

- 740** Introduce *bypass\_eoln*, to remove anomalous behavior on input files of length 1. (Suggested by DRF after the problem was discovered by LL). §31 R

**4 Jul 1983**

- 741** Allow codes like `^^b` as well as `^^B`. §352, 355 G
- 742** Introduce new parameters `\escapechar`, `\endlinechar`, `\defaultthyphenchar`, and `\defaultskewchar`, to make T<sub>E</sub>X less dependent on the character set. (This affects many modules, since a lot of error messages must be broken up so that they use *print\_esc*.) G

**7 Jul 1983**

- 743** Use a system-dependent function *erstat* when opening or closing files (suggested by DRF). §27 P

**11 Jul 1983**

- *The computer is back up after more than 50 hours down time (due to air conditioning failure).*
- 744** Show total glue in the output of `\tracingpages`. §985 I
- 745** Guard against insertion into an hbox. §993 R
- 746** Legalize the assignment `<tokenvar>=<tokenvar>`. §1227 C
- 747** Introduce a new parameter `\errhelp`. §1283 I
- 623 → **748** Don't forget to check *global\_defs* when `\tabskip` is changed. §782 F



**12 Jul 1983**

- 749** Allow an `\outer` macro to appear after `\string`, `\noexpand`, and `\meaning` (Todd Allen). §369, 471 C
- 750** Make ‘`\the`’ an expandable control sequence (i.e., move it from the stomach to the throat); this cleans up several annoying glitches. §367 C
- 620 → **751** Allow `\unhbox` and `\unhcopy` in math mode if the box is void. §1110 C

**13 Jul 1983**

- *I lectured for four hours at the TUG meeting today after very little sleep!*

**16 Jul 1983**

- *The following were suggested by TUG meeting discussions.*
- 752** Round the value of *default\_rule* more properly: It should be 26215. §463 L
- 700 → **753** Fix `\mathaccent` again; it’s still not right! The final height should be the maximum of the height of accented letter without superscript and the height of unaccented letter with superscript. §742 Q
- 754** Add a new feature `\newlinechar`. §59 G
- 755** Allow boxes and rules in dictionaries (suggested by somebody from Hewlett-Packard). §1121 G
- X28 → **756** Show all token expansions, not just macros, when `\tracingcommands`. §367 I
- 757** Allow `\char` in a `\hyphenation` list. §935 C
- 758** Introduce a new feature `\aftergroup`; it can be implemented with *save\_stack*. §326 G
- 759** Run the running dimensions to alignment boundaries (suggested by ARK). §806 C

**17 Jul 1983**

- 760** Zero out *hyf* values at the edges, so that weird pattern data cannot lead to Pascal range checks. §965 R
- X190 → **761** Decrease the `hc` codes for hyphenation, so that code 127 cannot possibly be matched. §937, 962 R
- 672 → **762** Allow whatsits after hyphenatable words. §899 C
- 604 → **763** Represent an italic correction as an explicit kern. §1113 C

**18 Jul 1983**

- 764** Allow lowercase letters in file names. §519 C
- 765** Change the message ‘No output file’ to: ‘No pages of output’. §642 I
- 766** Confirm that a quiet mode is being entered, when error interaction ends with Q, R, or S (suggested by ARK). §86 I
- *Version 0.999 was finally installed today; a new program listing has been printed.*
  - *From now on, I plan to keep all section numbers unchanged.*
  - *I’m done writing Appendix H; beginning to revise Chapter 20.*

**25 Jul 1983**

- 663 → **767** Allow space after ‘to’ in the `\read` command (FY). §1215 C
- *To bed at 1pm today.*

**27 Jul 1983**

- 665 → **768** Stack the current type of `\if`; this precaution is necessary in general (FY). §498 S
- *To bed at 2pm today.*

**29 Jul 1983**

- 769** Avoid putting a control sequence in the hash table when it occurs after `\ifx`. (Requested by Math Reviews people.) §507 E
- *Finished a version of The TeXbook lacking only Appendices D, E, and I, for distribution to interested readers.*
  - *To bed at 10:30pm, planning to arise regularly at 6am for a change.*

**31 Jul 1983**

766 → 770 Call *update\_terminal* when going quiet (HWT). §86 I

**1 Aug 1983**

771 Don't put an empty line at the end of an `\input` file! (This simplifies the rules and the program, and also gets around a bug that occurred at the end of files with `end_line_char < 0`.) §362 C

- *The changes above went into Version 0.9999, which was widely distributed.*

**16 Aug 1983**

665 → 772 Rectify a ridiculous gaffe: I initialized *q* every time the loop of *change\_if\_limit* was performed! (Found by FY.) §497 B

648 → 773 Distinguish 'string' from 'strings' when reporting statistics. §1334 I

774 Introduce *lx*, to correct a bug in `\xleader` computations (found by FY). §627 A

**20 Aug 1983**

775 Don't forget to apply `\/` to ligatures. §1113 F

- *Today I began to read all previous issues of TUGboat, in preparation for Appendix D.*

**27 Aug 1983**

776 Add debugging hack number 16, to help catch subtle data structure bugs. §1339 I

777 Remove redundant setting and resetting of *name\_in\_progress*. §531 E

618 → 778 Suppress `\input` during a font size spec; otherwise *cur\_name* is clobbered (found by MDS). §1258 S

779 Introduce new conditionals `\ifhbox` and `\ifvbox`. §505 G

**29 Aug 1983**

750 → 780 Test for an empty list, if emptiness will mess up the data structure. (Found by Todd Allen.) §478 D

624 → 781 Use *fast\_store\_new\_token* in another place for efficiency. §466 E

782 Say 'has only' instead of 'has'. §579 I

- *These changes yield Version 0.99999, used only at Stanford.*

**30 Aug 1983**

783 Make funny blank spaces showable. §298 C

**31 Aug 1983**

754 → 784 Make `\newlinechar` affect *print\_char*, not just *print*. §58 C

**4 Sep 1983**

785 Add new features `\lastkern`, `\lastpenalty`, `\unkern`, `\unpenalty`. §424, 996, 1105 G

- *OK, Appendix D is finished!!*
- *The above changes have been installed in Version 0.999999.*

**17 Sep 1983**

548 → 786 Don't bother making duplicate font identifiers; that was overkill, not really needed. §1258 P

- *Will this be the historic last change to T<sub>E</sub>X?*

**18 Sep 1983**

787 Correct a minor inconsistency, 'display' not 'displayed'. §211 I

**20 Sep 1983**

604 → 788 Treat the kerns inserted for accents as explicit kerns. §1125 C

**26 Sep 1983**

789 Change 'log' to 'transcript' in several messages. §535, 1335 I

- *The index was finished today; I mailed the entire T<sub>E</sub>Xbook to Massachusetts for final proofreading before publication.*

**1 Oct 1983**

**790** Prevent uninitialized trie positions in case of overflow (found by Bernd Schulze). §944 D

**7 Oct 1983**

- *Henceforth our weekly ‘T<sub>E</sub>X lunch’ meetings will be called ‘METAFONT lunch’.*
- *DRF begins to produce The T<sub>E</sub>Xbook on our APS phototypesetter.*

**14 Oct 1983**

633 → **791** Ignore spaces at the ends of lines also in `TEX.POOL` (found by DRF). §52 P

610 → **792** Initialize the *history* variable at *start.here* (DRF). §1332 D

**18 Oct 1983**

**793** Extend *runaway* to catch runaway text (suggested by FY). §306 I

**794** Reset *cur\_cs* after *back\_input*, not after scanning the ‘=’ (found by FY). §1226 D

**24 Oct 1983**

638 → **795** Change the error recovery for bad delimiters, in accordance with the changed syntax. (Found by Barry Smith.) §1183 I

**9 Nov 1983**

**796** Optimize the code a bit more, based on empirical frequency data gathered during September and October: In §45, use the fact that the result is almost always true. In §380, delete ‘**while true do**’ since many compilers implement that badly. Rewrite §852 to avoid calling *badness* in the most common case. §45, 380, 852 E

**3 Dec 1983**

**797** Don’t forget to call **error** after the message has been given (noticed by Gabi Kuper). §500 F

- *Version 1.0 released today incorporates all of the above.*

**9 Dec 1983**

- *Dinner party with 36 guests to celebrate T<sub>E</sub>X’s coming of age.*

**2 Feb 1984**

786 → **798** Reinstall `\font` precautions that I thought were unnecessary. I overlooked many problematic possibilities, like ‘`{\font\ a=x \global\ a} \the\font`’ and ‘`\font\ a=x \font\ b=x \let\ b=\undefined \the\ a`’, etc. (Found by Mike Urban.) The new remedy involves removal of the *font\_ident* array and putting the identifiers into a frozen part of the hash table; so there’s a sprinkling of corrections in lots of modules. But basically the change is quite conservative, so it shouldn’t spawn any new bugs (it says here). §222, 267, 1257 S

**9 Feb 1984**

**799** Remove the possibility of double interrupt, in a scenario found by Clint Cuzzo. §1031 S

**12 Feb 1984**

**800** Improve spacing in a formula like  $\$(A, <)\$$ . §764 Q

**13 Feb 1984**

**801** Avoid a bad **goto**, as diagnosed by Clint Cuzzo and George O’Connor. (Must not go directly to *switch*.) §346 A

**802** Conserve string pool space by not storing file name in two guises (suggested by DRF). §537 E

**26 Feb 1984**

**803** Make scaled output look cleaner by printing fewer decimals whenever this involves no loss of accuracy. (Suggested by METAFONT development.) §103 I

**2 Mar 1984**

- 804 Maintain 17-digit accuracy, not 16; now constants like ‘.00000762939453126pt’ will round correctly. §452 R

**16 Mar 1984**

- 805 Plug a loophole that permitted recursion in *get\_next*, by disallowing deletions in *check\_outer\_validity*. §336 R

**24 Mar 1984**

- 806 Open the terminal before trying to wake it up, when the program starts bad. §1332 I

**27 Mar 1984**

- 807 Check that  $k < 63$ , to avoid the `\patterns{xxx...xxdxxx dxxx}` anomaly found by Jacques Désarménien. §962 R

**11 Apr 1984**

- 808 Supply code for the missing case *adjust\_node* in *copy\_node.list*. §206 F
- *Yoicks, how could serious bugs like that have escaped detection?*

**11 Jun 1984**

- 627 → 809 Initialize *char\_base*, etc., for *null\_font*. (Found by Nick Briggs.) §552 D
- 810 Clear the *buffer* array initially (Briggs). §331 R

**21 Jun 1984**

- 811 Look ahead for ligature or kern after a `\chardef`’d item (Désarménien). §1038 C

**4 Jul 1984**

- 812 Make the quarterword constraint explicit with a new ‘*bad*’ case (19). §111 R

**7 Jul 1984**

- 813 Optimize *firm\_up\_the\_line* slightly, to be consistent with the METAFONT program. §363 E

**8 Jul 1984**

- 814 Give additional diagnostics when `\tracingmacros>1`. §323 I
- *The changes above were incorporated in Version 1.1, released July 9, 1984.*

**27 Jul 1984**

- 815 Say ‘see the transcript file’ after handling offline `\show` commands. (Suggested by METAFONT.) §1298 I

**20 Oct 1984**

- 816 Allow ‘0’ in response to error prompts. §84 I
- *Those two changes led to Version 1.2.*

**25 Nov 1984**

- 817 Don’t forget to check for *null* before looking at subfields of a node. (This was “dirty Pascal,” with two quarterword 0’s read as a halfword.) §846 R
- 818 Ditto in another place! §939 R
- 819 Remove the fixed-at-compile-time partition between lower and upper memory. §116, 125, 162 E
- *This major change in memory management completes Version 1.3, which was published in preliminary looseleaf form as ‘T<sub>E</sub>X: The Program’.*

**20 Dec 1984**

- 820 Keep the *node\_size* field from overflowing if the lower part of memory is too large. §125 R
- *That was another bug in existence from the beginning!*

**5 Jan 1985**

- 821 Improve the missing-format-file error (DRF). §524 I

**7 Jan 1985**

**822** Update the terminal right away so that the welcoming message will appear as soon as possible (DRF). §61 I

**23 Jan 1985**

**823** Convey more uncertainty in the help message at times of *confusion*. §95 I

610 → **824** Improve the *history* logic in the *warning-issued* case. §245 I

**18 Feb 1985**

810 → **825** Stick to standard Pascal: Don't use *first* in a **for** loop. [Some procedures "threaten" it globally, according to British Standard 6192, section 6.8.3.9.] (Pointed out by CET.) §331 P

**11 Apr 1985**

**826** Prevent nonexistent characters from being output by unusual combinations of ligatures and hyphenation. §915 S

**15 Apr 1985**

819 → **827** Compute memory usage correctly in INITEX; the previous number was wrong because of a **WEB** text macro without parentheses (DRF). §164 L

**16 Apr 1985**

**828** Speed up *flush\_list* by not calling *free-avail* (DRF). §123 E

**17 Apr 1985**

788 → **829** Introduce a special kind of kern for accent positioning; it must not disappear after a line break. §837, 879, 1125 A

**18 Apr 1985**

755 → **830** Prevent `\lastbox` and `\unkern` from removing discretionary replacements. §1081, 1105 R

- *That completes Version 1.4.*

**26 Apr 1985**

**831** Don't try *TeX\_area* if a nonstandard file area has been specified (DRF). §537 C

- *That was #401 in TeX78; I never learn!*

**30 Apr 1985**

754 → **832** Eliminate the limitation on `\write` length; the reason for it has disappeared (Nancy Tuma). §1370 C

**8 May 1985**

819 → **833** Allocate two words for the head of the *active* list (CET). §162 D

**11 May 1985**

**834** Change *wterm* to *wterm\_ln* after a bad beginning (Bill Gropp). §1332 I

806 → **835** Don't open the terminal twice (CET). §1332 E

**22 May 1985**

**836** Test for *batch\_mode* after trying to open the transcript file, not before (DRF). §92 R

**837** Be prepared for string pool overflow while reading the command line! (This bug was first found in METAFONT, when it could occur more easily.) §525 R

**7 Aug 1985**

**838** Fix a bug in `\edef\foo{\iffalse\fi\the\toks0}`: TeX should stay in the loop when expanding non-`\the`. (Found by Dan Brotsky.) §478 A

- *The above changes were incorporated in Version 1.5.*

**27 Nov 1985**

764 → **839** Make 'plain' a lowercase name, for consistency with the manual. §521 C

669 → **840** Wake up the terminal for `\show` commands. §1294, 1297 I

- *The above changes were incorporated in Version 2.0, which was published as Volume B of the Computers & Typesetting series.*

**15 Dec 1986**

841 Punctuate the Poirot help message more carefully. §1283 I

**28 Jan 1987**

842 Make sure that *max\_in\_open* doesn't exceed 127 (DRF). §14 R

680 → 843 Don't allow a `\kern` to be clobbered at the end of a pre-break list when a discretionary break is taken. (A missing 'else' was the source of the error, diagnosed incorrectly before.) §881 D

844 Take account of discarded nodes when computing the background width after a discretionary. §840 D

- *That was the first really serious bug detected for more than 17 months! I found it while experimenting with right-to-left extensions.*
- *Version 2.1 was released on January 26, 1987.*

**5 Feb 1987**

845 Remove cases in *shorthand\_def* that cannot occur (found by Pat Monardo). §1224 E

**14 Apr 1987**

846 Improve robustness of data structure display when debugging (Ronaldo Amá). §174, 182 R

**21 Apr 1987**

847 Make the storage allocation algorithm more elegant and efficient. §127 E

**22 Apr 1987**

742 → 848 Calculate the empty-line condition properly when *end\_line\_char* is absent. §360 A

- *The previous three changes were found while I was teaching a class based on Volume B; they led to Version 2.2.*

**28 Apr 1987**

849 Avoid closing a file when T<sub>E</sub>X knows that it isn't open (JS). §560 E

**3 Aug 1987**

850 Clean up unfinished output if it's necessary to *jump\_out* (Klaus Gunterman). §642 S

- *That makes Version 2.3; subsequent version numbers won't be logged here.*

**19 Aug 1987**

851 Indent rules properly in cases like  
`\hangindent=1pt$$\halign{...\cr\noalign{\hrule}}$$`. §806 A

**20 Aug 1987**

852 Introduce *co\_backup* because of cases like `\hskip 0pt plus 1fil\ifdim` (Alan Guth). §366 S

**9 Nov 1987**

853 Change the calculation for number of leader boxes, so that it won't be too sensitive to roundoff error near exact multiples (M. F. Bridgland). §626 S

**17 Nov 1987**

854 Replace my stupid algorithm for fixed-point multiplication of negatives (WGS). §572 A

**12 Dec 1987**

855 Fix a typo in the initialization of hyphenation tables (PB). §952 B

- *That error was almost completely harmless, thus undetectable, except if some `\lccode` is 1 and no `\patterns` are given.*

**23 Dec 1987**

564 → 856 Be more cautious when "relaxing" a previously undefined `\csname`; you might be inside a group (CET). §372 S

**20 Apr 1988**

**857** Make sure *temp\_head* is well-formed whenever it can be printed in a “runaway” message: Consider constructions like `\outer\def\ao{}\a\ao` (Silvio Levy). §391 S

**24 Apr 1988**

**618** → **858** Avoid conflicting use of the string pool in constructions like `\def\#1{}\input a\\z` (Robert Messer). §260 S

**10 May 1988**

**859** Amend the `\patterns` data structure when *trie\_min* = 0 (PB). §951, 953 R

**25 May 1988**

**860** Guarantee that *trie\_pointer* cannot be out of range. §923 R

**618** → **861** Avoid additional bugs like #858 in constructions like `\input a\romannumeral1`, etc. §464, 465, 470 S

**618** → **862** Prevent similar string pool confusion that could occur during the processing of `**\input\romannumeral6`. §525 R

**19 Jun 1988**

**819** → **863** Prevent a negative dividend from rounding upward, causing a loop (CET). §126 S

**819** → **864** Adopt a smoother allocation strategy when memory is nearly gone (CET). §126 E

**20 Jun 1988**

**852** → **865** Initialize *cur\_order*, now that it’s being backed up (Tsunetoshi Hayashi). §439 D

**6 Nov 1988**

**612** → **866** Disable *fatal\_error* in *prompt\_input*, so that *open\_log\_file* can use it safely (Tim Morgan). §71 S

**836** → **867** Force terminal output whenever *open\_log\_file* fails. §535 S

**14 Dec 1988**

**866** → **868** Restore *fatal\_error* in *prompt\_input*, but don’t let it be unsafe for *open\_log\_file*. §92, 534 P

**23 Jan 1989**

**869** Give *q* a legal value when recovering from “infinite shrinkage” error. §976, 1004 D

**17 Feb 1989**

**758** → **870** Avoid spurious error message for `\aftergroup\relax\dump` by avoiding inaccessible `\aftergroup` tokens (FM and Rainer Schöpf). §280 D

**20 Mar 1989**

**871** Don’t refer to *link(null)* even when it “can’t happen” (PB). §791 R

**7 Jun 1989**

**872** Avoid confusion from `$$\begingroup\halign{\#\cr}$$` (FM). §1130 S

**20 Jun 1989**

**873** Put fraction digits into dynamic memory, not the global *dig* array, because of constructions like `.5\ifdim.6` (FM). §452 S

**17 Jul 1989**

**874** Prevent embarrassing attempts to report errors before the string mechanism has been fully initialized, for example when the command line exceeds the buffer size (WGS). §31 S

**16 Aug 1989**

**875** Allow integer products to be 31 bits long (FM). §105 M

**31 Aug 1989**

**441** → **876** Increase the number of tokens shown by *token\_show* (J. Lavagnino). §295 C

**877** Avoid confusion from `$$\begingroup\eqno$$` (FM). §1140 S



- *The recent TUG meeting turned out to be an extend-T<sub>E</sub>X-for-the-nineties party! I agreed that some extensions for non-English languages ought to be made while I still knew how to do them. (In other words, I broke my firm commitment to keeping T<sub>E</sub>X completely stable; but in this case nobody objected.) The following eleven changes were coded during the month of September.*

### 30 Sep 1989

- 878 Install major change allowing general 8-bit code input. §38, 352 G
- 879 Install major change allowing multiple hyphenation tables (M. Ferguson). §923 G
- 880 Introduce new parameters `\lefthyphenmin` and `\righthyphenmin`. §923 G
- 881 Introduce major new ligature capabilities including implicit boundary characters. §908, 1037 G
- 882 Install new `\inputlineno` feature suggested by MDS. §424 G
- 883 Install new `\holdinginserts` feature suggested by FM. §1014 G
- 884 Install new `\badness` feature. §424, 664 G
- 885 Install new `\emergencystretch` feature. §863 G
- 886 Install new `\errorcontextlines` feature suggested by FM. §311 G
- 887 Recover from anomaly when hyphenation `char_warning` clobbers `old_setting`. §863 S
- 888 Make it easier to change the format extension (Don Hosek). §520, 1328 P

### 16 Oct 1989

- 889 Avoid range check in null font with `bc=256` (PB). §565 R

### 22 Nov 1989

- 856 → 890 Prevent `save_stack` conflicts in `{\hbox\expandafter{\csname\endcsname}}` and similar constructions (WGS). §645, 1117 S
- 858 → 891 System-dependent parts of file names must be addressed relatively, not absolutely (FM and Rainer Schöpf). §516, 517 S

### 3 Dec 1989

- 880 → 892 Allow different hyphenmins in the same paragraph (M. Ferguson). §1376 G
- 893 Distinguish `\par` from characters on `\if` tests. (MVL). §334 S
- 378 → 894 Alignments need to be more robust against malicious attacks (MVL). §782 S
- 895 Don't let kerns in discretionaries disappear at breaks (MVL). §869 C
- 881 → 896 Make the new hyphenation reconstruction procedure less cautious, so that it doesn't lose hyphens found by the old method. §914 Q

### 11 Dec 1989

- 879 → 897 Make an undumped trie dumpable again (PB). §1325 D

### 18 Dec 1989

- 588 → 898 Allow access to page totals in `\output` routines (FM and Chris Rowley). §421 G

### 22 Jan 1990

- 611 → 899 Recognize more cases of unbalanced `\output` (CET). §1026 R

### 29 Jan 1990

- 758 → 900 Make `\aftergroup` work properly after `\eqno` (Michael Downes). §1194 S

### 1 Feb 1990

- 878 → 901 Fix one more case of `end_line_char_inactive` (WGS). §360 S

### 22 Feb 1990

- 902 Don't lose the last active node when total demerits are very high (FM). §836, 854 R

### 13 Mar 1990

- 903 Doublecheck math fonts after making equation number (MVL). §1194 D
- 904 Don't forget to rule out charnodes before testing `type` (MVL). §805, 1202 D

**23 Mar 1990**

- 881** → **905** Don't change the font of punctuation preceding a hyphenated word (Scott C. Allendorf). §**903** F
- 906** Balance the parentheses shown on the terminal during normal runs. §**1335** I
- 907** Optimize `\ifx\p\q` after `\let\p=\q` (MVL). §**508** E
- 908** Treat migration properly in displays (MVL). §**1199, 1205** S
- *We're now up to Version 3.0; I sincerely hope all bugs have been found.*

**11 May 1990**

- 881** → **909** Initialize `\nullfont` ligature parameters (Lance Carnes). §**552** F

**22 July 1990**

- 579** → **910** Treat `\prevgraf` as zero within `\write` (Bogusław Jackowski). §**422** S

**26 July 1990**

- 911** Report '1.1' when first line of file overflows buffer (George Russell). §**538** S

**5 December 1990**

- 878** → **912** Translate unprintable characters in font identifiers (WGS). §**63** S

**28 December 1990**

- 913** Avoid range check when there are 65536 or more pages (Eberhard Mattes). §**642** R

**20 September 1991**

- 878** → **914** Improve error message for `\mathchar` out of range. §**436** I
- 878** → **915** Retain unprintable internal strings in 8-bit form (FM). §**59** S
- 881** → **916** Retain right punctuation context for ligature reconstruction (problem found by Brian Hamilton Kelly). §**903** S

**10 January 1992**

- 881** → **917** Also avoid producing a double kern at boundary (CET). §**897** S
- 918** Disallow `\setbox` where it doesn't work (Robert Hunt). §**1241, 1270** S
- 919** Robustify `\mskip` and `\mkern` in presence of negative quad (WGS). §**716, 717** S
- 679** → **920** Defend against 'J-f' in `\read` (Michael Downes). §**483** S
- 798** → **921** Save string memory if font occurs repeatedly (Bogusław Jackowski). §**1260** E
- 784** → **922** Don't let `\newlinechar` interrupt unprintable expansion (Bernd Raichle). §**59, 60** S

**7 February 1992**

- 881** → **923** Restore `cur_1` properly when boundary character doesn't exist (Mattes and Raichle). §**1036** D

**17 July 1992**

- 892** → **924** Use current language at beginning of horizontal mode (Rainer Schöpf and CET). §**1091, 1200** C

**17 December 1992**

- 879** → **925** Avoid (harmless) range errors (Philip Taylor and CET). §**934, 960** R

**25 February 1993**

- 881** → **926** Protect kerns inserted by boundary characters (William Baxter). §**837, 866** C
- 917** → **927** Don't let boundary kern disappear after hyphenation. §**897** S

**26 June 1993**

- 668** → **928** Avoid potential future bug (Peter Breitenlohner). §**628, 637** R

**17 December 1993**

- 881** → **929** Boundary character representation shouldn't depend on the font memory size (Berthold Horn). §**549, 1323** S

**10 March 1994**

- 930** Huge font parameter number may exceed array bound (CET). §**549** R

**4 September 1994**

- 926**  $\mapsto$  **931** Math kerns are explicit (Walter Carlip). §**717** F  
**932** Avoid overflow on huge real-to-integer conversion. §**625, 634** R

**19 March 1995**

- 933** Avoid spurious reference counts in format files (PB). §**1335** R

**23 November 1998**

- 934** Make sure that TeX is certifiably Y2K-safe. §**1328** R

**12 July 1999**

- 255**  $\mapsto$  **935** `\xleaders` often drops the final box (Hiroshi Nakashima). §**627, 636** A

**30 August 2001**

- 789** Don't allow a million unbalanced braces followed by `\cr` outside of any alignment (Ralf Roth). §**789** R  
**790** Don't allow end-template except at end of template (Roth). §**325, 1131** R

**30 September 2002**

- 791** Improve rounding of glue during output (M. F. Bridgland). §**625, 634** Q