

- k) Octal computations and constants were changed to HEX.
- l) A POSTAMBLE file called PST is created in CLOSEOUT to make this information easier to access using standard IBM access methods.
- m) The DVI file is always named DVI so that the same DDname may be used in batch JCL.
- n) Code relating to DIRECTORY references was commented out; it is not needed in PASCAL/VS.
- o) The FONT file directory was changed to a VS partitioned data set.

A tape containing the source for our version of PTEX, T_EX/370, will be available soon. For details on obtaining a copy write to:

Susan Plass
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Polya Hall, Room 203
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When available, T_EX/370 will be supplied on an IBM standard-labeled 1600 bpi tape—please don't send us a tape.

We plan to fix bugs, implement new releases, and incorporate comments and criticisms into T_EX/370 and will publish those changes periodically to users who have ordered T_EX/370. No promises are made or implied about responses outside of such newsletters, but we do welcome feedback and will try to act on it. We also plan to implement output drivers for several output devices attached to our 3033/3081. These will be announced as they are implemented.

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T_EX IN ISRAEL

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Over the past summer, T_EX was brought up at the Weizmann Institute of Science in Rehovot, Israel. It is running there on an IBM 4341 under CMS, with the Imperial College Pascal P4 compiler, and producing output on a Versatec 1200-A.

Many of the issues addressed in this implementation of T_EX have been treated (repeatedly) in previous issues of TUGboat, with regard to other machines and other versions of Pascal; nevertheless, for the sake of completeness, I will briefly outline the major points of interest. It should be noted, however, that this was an old version of T_EX, received from Stanford in January 1981.

Editor's note: David Fuchs comments, "It is unfortunate that Jeff had to use an old version of T_EX-Pascal. Most of the following points had already

been cleared up by Ignacio Zabala and Eagle Berns while Eagle was working on compiling T_EX under Pascal/VS. Because Pascal/VS packs records and has an OTHERS construct, it seems more suitable for the current T_EX than the P4 compiler. T_EX82 is currently planned to require OTHERS, but even the current T_EX makes no assumptions regarding packing. The routine READFONTINFO is system-dependent, and the documentation in T_EX82 will be more explicit about exactly which bits go where.

- (1) In Imperial College Pascal, there is no default case for CASE statements; instead, an IF-THEN-ELSE construction was used to perform its function.
- (2) CASE statement selector variables being out of range caused a Pascal crash (this is not the case in Stanford's Pascal). An IF-THEN construction made sure CASE statements were accessed only when the selector variable was in range.
- (3) Labels that were declared but not used had to be removed.
- (4) The INITPROCEDURE construct does not exist in Imperial College Pascal; instead, a procedure called INITIALIZE was introduced in its place.
- (5) Overly large procedures had to be split for compilation to succeed. In the TEXPRE module, these procedures were INITIALIZE, INITMATHCODES, INITFONTCODES, INITSUF and INITPREF. In the TEX module, the procedures JUSTIFICATION and MLISTTOHLIST had to be split.
- (6) Imperial College Pascal does not allow assignment between variables of differently named (though identically defined) types. Thus, the TYPE declarations of PCKDHYPHBITS, PCKDCONSPAIR and TBLREADOUTTYPE in the TEX and TEXPRE modules were changed, respectively, to declarations of PACKEDHYPHENBITS, PACKEDCONSONANTPAIRENTRY and TABLEREADOUTTYPE so as to be compatible with the corresponding SYSDEP declarations.
- (7) The name INPUTFILE was used in TEX both as a procedure name and as an identifier of an enumerated type. To allow compilation, the identifier name was changed.
- (8) FILES OF ASCII had to be changed to FILES OF CHAR.
- (9) The ORD and CHR functions in Imperial College Pascal map to and from the EBCDIC character encoding scheme. This conflicted with T_EX's expectations of an internal ASCII

encoding of all characters. Two translation arrays were utilized to convert characters to and from ASCII, thus satisfying TeX's needs.

- (10) PRINTOCTAL was altered so as to work on a 32 bit machine.
- (11) The procedure CONNECT was used to link internal Pascal file names to real-world files, replacing TeX's multiple parameter RESET and REWRITE procedures.
- (12) All code that looked for an "end-of-line" character (usually a carriage return) was changed to utilize the EOLN function. This was necessary due to the record-oriented structure of IBM files. Likewise, instead of writing a carriage return onto a file to signify an end-of-line, the procedure WRITELN was used to finish off a record and transfer it to a file.
- (13) Imperial College does not pack records as expected in the SYSDEP module code. To overcome this, the PTEXINI.TBL file was changed from a file of INTEGER to a file of MEMORYWORD, extra routines were introduced to build correct font data structures, and bytes were explicitly packed into integers for the DVI file.
- (14) The SCANNUMBER routine in TEX and TEXPRE makes no check for overflow as it reads in a number from the user's TeX input file. If the hapless user includes too large a number, Pascal crashes, and there is no way of knowing that the overflow was not internal to TeX (i.e. some previously undiscovered bug). A check was introduced in the SCANNUMBER routine so that if overflow is about to occur, the ERROR procedure is called. This gives a standard dump of the buffer and allows the user a graceful recovery.

Due mainly to Imperial College Pascal's lack of record packing facilities (which causes MEMORYWORDS to each occupy 4 words of memory), it is necessary to have a runtime storage allocation of approximately 2000K to run TeX. Production of raster files for the Versatec takes about 700K. As of this writing, the system has been put through a series of relatively small tests, and (so far) seems to be working without difficulty.

As with all those who have brought TeX up at various installations, I have several suggestions for changes to the code; these are intended solely to aid portability, and increases in portability may, of course, be purchased at a cost to some other important consideration (such as efficiency). Nevertheless, if TeX-in-Pascal is really intended to be a portable program, there ought to be more consideration of

standard Pascal features, and sensitivity to differing machines. The two main suggestions are:

- (1) The OTHERS construct should be removed once and for all; it has no place in code that is advertised as portable, especially not in the actual TEXPRE and TEX modules (as opposed to the SYSDEP module). Its removal was time consuming, and it should not have to be carried out repeatedly at various installations. At times, finding the correct values to use in the IF-THEN construct was non-trivial due to nesting of CASE statements and the appearance of labels within procedures. In addition, there was an abnormally high chance of an error creeping into the code; such an error would be extremely difficult to track down.
- (2) Assumptions about packing should be removed from the code; experience has shown that this restructuring is quite feasible. Although this will result in slight degradation of TeX's efficiency at some installations, it will cause TeX itself to be implemented with much greater ease. This is especially crucial in the READFONTINFO routine, where insufficiently explained assumptions about packing led, initially, to a serious implementation error. To help increase efficiency at those installations with "correctly" packing compilers, helpful hints on how to convert certain code should be included with the documentation; the default, however, ought to be code that will run even in a non-packing environment.

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TeX AT THE UNIVERSITY OF MICHIGAN SUMMARY OF PROGRESS

David Rodgers

The University of Michigan Computing Center has installed TeX on an IBM 370/148 running under VM(CMS). Work continues on converting the system-dependent module to run under the MTS operating system on an Amdahl machine. The installation process would have gone unhindered, except for our inexperience with Pascal, the VM/CMS operating system, and the system editor. The entire installation process required about three weeks of full-time effort (spread over six weeks) and probably could have been done in half the time by an experienced Pascal/VM/CMS programmer.

A device driver has been installed for a Linotron 202 phototypesetter in the Ann Arbor area and we are evaluating options for supporting other proof-