

**digital**

# Software Product Description

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PRODUCT NAME: 4K Paper Tape Software Kit (PTS-8) INT/SPD 1.1.0

DESCRIPTION:

Provided with most PDP-8 family computers DIGITAL manufactures is a set of papertape software to aid the PDP-8 user in his program development. Included in this kit are the following programs:

EDIT (Symbolic Editor) is used to create and modify ASCII source files so that these files may be used as input to other programs, such as FORTRAN, or SABR. EDIT is very flexible: it may be used to create symbolic programs or data files at the console terminal; examine, edit, and correct the files; and then prepare an ASCII papertape that is suitable input to a wide variety of processing routines. EDIT includes a search feature which allows the programmer to scan a line of text for the next occurrence of a specified character. Other commands permit blocks of text to be inserted, deleted, appended, listed or changed. Once the internal text buffer contains a correct image of the file, EDIT may be instructed to punch a specified portion of the file onto paper tape for subsequent editing or processing.

EDIT runs on any standard PDP-8. It occupies about 1000 memory locations, allowing maximum space for text buffering, and provides 15 powerful editing commands. Unlike many line editors, EDIT permits individual characters to be changed without retyping the entire line. It is fully interactive, so that editing changes may be verified and recorrected if necessary.

ASSEMBLERS - Program Assembly Language provides optimum utilization of the PDP-8 processor because there is a one-to-one correspondence between PAL mnemonics and PDP-8 machine instructions. Maximum programming efficiency is maintained through full provision for microprogramming, memory allocation, direct or indirect addressing, and the like. Programs written in PAL may be supplied as input to any class of PDP-8/E assemblers which will translate the symbolic language program into its machine language equivalent.

PAL III, the basic PDP-8 assembly program, is a two-pass assembler with optional third pass that uses either high- or low-speed paper tape and console terminal I/O. The PAL III assembler builds a table of user-defined symbols during its first pass. At the end of the first pass, the input tape is reloaded for a second pass, during which PAL III generates a binary format program tape. The optional third pass may be used to produce a full symbolic program

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and symbol table listing on the console terminal and/or paper tape, if desired. Like all PDP-8/E assemblers, PAL III performs extensive error diagnosis and identifies errors by location and type whenever they are encountered during an assembly. The PAL III assembler runs on any standard PDP-8/E.

MACRO-8 is an advanced, two-pass assembler with optional third pass that has the same features as PAL III plus many additional capabilities such as user defined macros, double-precision integers, floating point constants, arithmetic and Boolean operators, literals, text manipulation facilities and automatic off-page linkage generation. These features were incorporated by decreasing the size of the user symbol table, so that MACRO-8 requires only 4K of memory. The symbol table may be enlarged by deleting unused features, if necessary. Like PAL III, MACRO-8 uses console terminal and high- or low-speed paper tape I/O.

FOCAL (FOrmula CALculator) is a powerful interactive programming language designed for use by students, scientists and managers who require the full problem-solving capabilities of a general-purpose digital computer. FOCAL is similar to BASIC and FORTRAN in many respects, however, it is considered to be easier to learn and much better suited to one-time calculations. FOCAL has relatively low memory requirements, yet it offers a full range of mathematical functions, extendable I/O, and versatile self-editing capabilities. The basic FOCAL command set contains 12 powerful commands, which are all the programmer requires for most applications.

Since FOCAL was designed specifically for use with PDP-8 computers, it provides a highly optimized set of sophisticated, powerful commands that are tailored to the capabilities of the PDP-8. FOCAL runs on any standard PDP-8. It is fully documented in *Programming Languages*, 1972.

FLOATING POINT MATH PACKAGES - Use of a floating point package permits the PDP-8/E to perform arithmetic operations that many other computers can only duplicate after the addition of costly optional hardware. The three floating point packages available for the PDP-8/E represent three optimizations of the trade-offs between speed, accuracy and hardware configuration. Two 23-bit floating point packages maintain 5 or 6 significant (decimal) digits of accuracy. One package, designed for use with the KE8-E Extended Arithmetic Element, is capable of adding any two numbers in the range  $-10^{614}$  to  $<10^{614}$  in less than 160 microseconds. Floating point multiplication is accomplished in about 200 microseconds, while the cosine function, which is typical for routines having longer execution times, is implemented in less than 2.5 milliseconds. The other 23-bit floating point package executes without an extended arithmetic element and requires about 300 microseconds for a typical floating point addition, or 1 millisecond for a typical multiplication.

The 27-bit floating point package (not part of this basic software kit) is similar to the two 23-bit packages; however, it maintains greater accuracy for a smaller range of numbers. Without the use of an extended arithmetic element, the 27-bit package will operate on any two numbers in the range  $-10^{38}$  to  $<10^{38}$  in about the same amount of time required for the corresponding 23-bit operation.

All three floating point packages contain interpreters which will accept, decode and execute floating point pseudo-instructions. Individual components of the packages may be called as subroutines, in single instruction mode, to perform such operations as conventional arithmetic, trigonometric function evaluation, square root extraction, exponential function computation and calculation of natural logarithms. Alternatively, any of the floating point packages may be employed in interpretive mode, to operate on a string of pseudo-instructions. In this mode of operation, a package functions as a versatile software floating point processor which performs all of the operations listed above, as well as floating skips, floating point I/O, floating jumps to floating point subroutines, and so on.

Any one of the three floating point packages require only about 800 decimal storage locations in any memory field. They will accept floating point data or pseudo-instructions from any field of memory, and all three packages perform I/O operations on floating point numbers in either FORTRAN I, E, or F format.

Other programs provided in this kit include:

Binary loader and Help loader - a short program which, when in core, enables the computer to accept and store other programs; ODT and DDT - are service programs which allow the programmer to run his binary program on the computer and use the Teletype keyboard to control program execution, examine registers, change their contents, make alterations to a program, and much more; Octal memory dump - allows programmer to list various locations of memory on the terminal.

MINIMUM HARDWARE REQUIRED:

4K PDP-8  
Terminal

OPTIONAL HARDWARE SUPPORTED:

High-Speed Papertape Reader/Punch  
Additional memory

PREREQUISITE SOFTWARE:

None

ORDERING INFORMATION:

QF080-AB Single-user license\* for a PDP-8, 8I, 8S, 8L;  
binaries on papertape and manual

QF081-AB Single-user license\* for a PDP-8E, 8F, 8M;  
binaries on papertape and manual

SUPPORT CATEGORY: B - One year Software Performance  
Reporting (SPR) Service.

UPDATE POLICY: Any future updates will be available at the pre-  
vailing handling and service charges.

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single system and can be copied (with the inclusion of DIGITAL's  
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