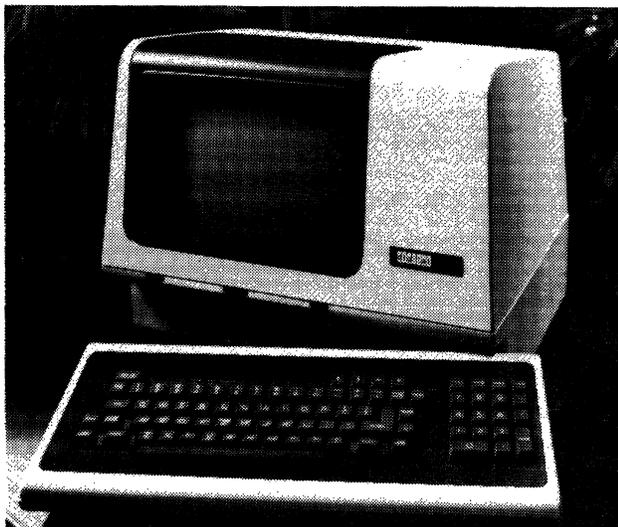


# Digital Equipment Corporation PDT-11 Terminal Family



The PDT-11/130 consists of a VT-100 CRT, keyboard, and twin minicartridge tape drives, which are located in the base of the display and provide the system with 512K bytes of mass storage. Like the other PDT-11 models, the 130 employs an LSI-11 processor, making it fully compatible with the DEC PDP-11 minicomputer series.

## MANAGEMENT SUMMARY

The PDT-11 Series of user-programmable terminals is another link in the Digital Equipment chain of products that provides users of distributed systems with virtually every piece of hardware that they require. As a mature product line, the PDT-11 Series continues to be available, but maintains a relatively low profile when compared to newer DEC offerings. In particular, the lower-end models (the 110 and 130) are generally sold only on a quantity basis to OEMs and large end users, although single-quantity units may be available on a refurbished basis.

The processor employed by PDT-11 family members is the LSI-11, a Digital Equipment-manufactured microprocessor that is compatible with the company's popular PDP-11 minicomputer. Consequently, users of the PDP-11 who are looking for a user-programmable terminal will naturally lean toward this DEC offering, which uses a subset of the RT-11 operating system developed for the PDP-11 (RSX-11S for the PDT-11/110).

The man/machine interface for the terminal family can be either a DEC VT-100 CRT display terminal or a DECwriter keyboard/prINTER terminal, depending on the PDT-11 model. Two versions of the PDT-11 family (the 11/110 and 11/130) have the processor housed within the cabinet of the VT-100. The PDP 11/130 provides up to 512K bytes of mass storage via twin minicassette tape drives built into the display monitor cabinet.

The PDT 11/150 has the processor housed in a separate cabinet which also houses two diskette drives. The ➤

DEC's only "official" programmable terminal offering. The PDT-11 is based on the DEC LSI-11 microprocessor, and supports a VT-100 display terminal or DECwriter teleprinter as the console plus up to three additional slave CRT or printer workstations.

All models are available with up to 60K bytes of RAM high speed memory. The PDT-11 130 also provides up to 512K bytes of mass storage via twin tape cartridges. The PDT-11 150 provides up to 512K bytes of mass storage via two floppy disks.

The PDT series of terminals is available for purchase only. A single PDT-11/110 with 32K bytes of memory sells for \$4,800. A PDT-11/151 with 60K bytes of RAM and twin diskette drive sells for \$9,300. Quantity discounts are available.

## CHARACTERISTICS

**VENDOR:** Digital Equipment Corporation, 146 Main Street, Maynard, MA 01754. Telephone (617) 897-5111.

**DATE OF ANNOUNCEMENT:** May 1978.

**DATE OF FIRST DELIVERY:** June 1978 (limited).

**NUMBER DELIVERED TO DATE:** Over 2600.

**SERVICED BY:** Digital Equipment Corporation.

## CONFIGURATION

The PDT-11 Terminal Family is a group of compatible terminal components ranging from a single CRT keyboard display station with integrated processor, up to a multiple station cluster with 60K bytes of memory, dual diskette drive storage, and a serial printer. All units are compatible with the DEC PDP-11 series of computers.

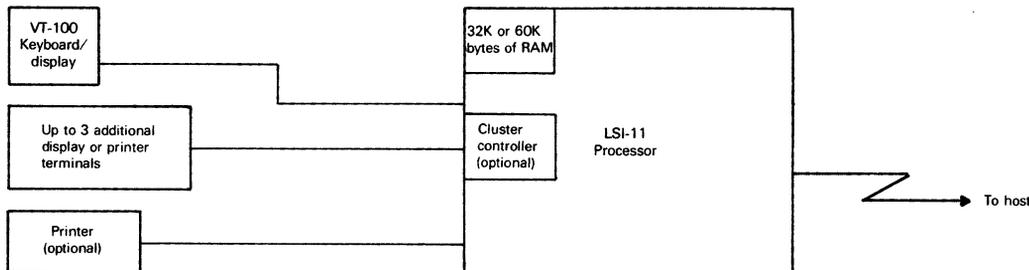
**PDT-11/110:** This is a VT-100 terminal to which has been added an LSI-11 microprocessor, 32K or 60K bytes of random access memory, a port for synchronous or asynchronous communications with a host system, a port for a local printer, and an optional cluster controller with interfaces for up to three additional VT-100 terminals, DECwriter teleprinters, other RS-232-C compatible CRT or hard-copy terminals. A 2K-byte ROM stores the terminal's bootstrap loader and self-diagnostic test routines. User programs may be automatically loaded from a DEC host processor or from a user-selected host via user-provided software.

**PDT-11/130:** This is a VT-100 terminal with all of the features of the PDT-11/110. In addition, the 130 is equipped with dual integrated minicartridge magnetic tape drives which provide up to 512K bytes of mass storage. User programs are stored locally in mass storage and loaded into main memory at execution time by the terminal's bootstrap loader; no direct down-line loading of main memory can occur. ➤

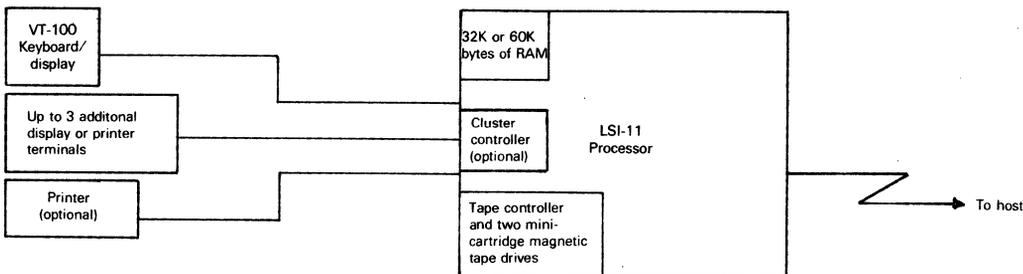
## Digital Equipment Corporation PDT-11 Terminal Family

### Configurations

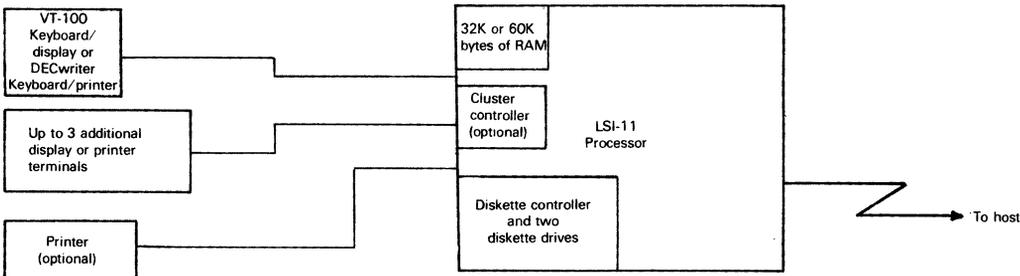
PDT 11/110



PDT 11/130



PDT 11/150



- diskettes accommodated are single sided, IBM 3740 compatible, 8-inch diameter removable platters, each of which contains 77 tracks and stores 256K bytes for a total of 512K bytes of diskette storage.

No user reaction appears in this report, because we could locate no PDT-11 users. □

- **PDT-11/150 Series:** This is a modular terminal that consists of a console, LSI-11 processor, and two diskette drives. The processor and the diskette drives are housed together in a desk-top cabinet; the console is separately housed. Each diskette drive provides up to 256K bytes of mass storage, for a maximum of 512K bytes per system. The PDT-11/150 Series models are distinguished by the type of console used: the PDT-11/151 uses a VT-100 CRT terminal; the PDT-11/152, an LA120 (DECwriter III) teleprinter terminal; and the PDT-11/153, an LA38 (DECwriter IV).

Like other PDT-11 models, the PDT-11/150 provides 32K or 60K bytes of memory, a 2K-byte system ROM, a printer port, a communications port, and an optional three-workstation cluster controller. Like the PDT-11/130, user programs are stored locally and booted into main memory by the terminal's bootstrap loader.

The PDT-11/150 Series also includes the Datasystem 150 (D150), a packaged version of the PDT-11/151 bundled with a CTS-300 operating system and (optionally) an LA120 printer. Except for keycaps, the PDT-11/151 and the D150 are identical in hardware; however, different protocols and programming languages, such as the RDCP 2780/3780 batch protocol, the DICAM 3271 interactive protocol, and the DIBOL programming languages, are supported on the D150. The D150 is upward-compatible with the DEC Datasystem 300 family of computers.

### TRANSMISSION SPECIFICATIONS

The PDT-11 terminal family supports both ASCII and DEC's DDCMP protocol. Other protocols can be implemented by adding a user-specified ROM. Full-duplex synchronous or asynchronous communications are supported at switch selectable speeds ranging from 50 to 9600 bps. Parity is also switch selectable. An EIA RS-232-C interface is standard on all models.

IBM 2780/3780 emulators are available for the PDT-11/130 and /150 and the Datasystem 150. The D150 also supports an IBM 3271 emulator.

### COMPONENTS

**CRT DISPLAY:** The VT-100 Terminal (Report C25-384-101) is a detached keyboard/CRT display featuring a 132

Digital Equipment Corporation  
 PDT-11 Terminal Family

► character line with blinking, underlining, double intensity and normal or reverse video as standard features. Characters are formed in a 7x9 dot matrix and double width and double height characters may also be displayed. A divided screen permits prompting to be displayed independently of keyed data.

The detachable keyboard is provided with a six foot coil cord. In addition to the typewriter keys there is an 18-key numeric/function keypad which provides calculator-style numeric entry and single keystroke entries for program controlled application functions. The power supply included in the basic VT100 is adequate to power any of the available options so that field upgrading is simplified.

**PROCESSOR:** The processor in all PDT-11 terminals is the DEC LSI-11, a microprocessor version of the DEC PDP-11 and compatible with that system with minor exceptions. (For example, the PDP-11 Extended Instruction Set (EIS) is not supported, and the PDT-11 goes about handling I/O using a separate I/O microprocessor, rather than emulating the PDP-11's I/O page function.)

The PDT-11's processor has a single-instruction cycle time of 490 nanoseconds, a memory access time of 400 nanoseconds, and an I/O latency of 30 to 125 microseconds, depending on the operation involved. It has a repertoire of 66 instructions, which are classified as follows:

**Single Operand Instructions—General** (e.g., clear, increment, decrement, complement, negate, test); **Shifts**; **Multiple Precision** (e.g., add and subtract with carry, extend sign); and **Rotate**. Many of these instructions have word and byte operand versions.

**Double Operand Instructions—General** (e.g., storage-to-storage move, add, subtract, compare); **Register Destination** (e.g., multiply, divide, Exclusive OR); and **Logical**. Move and Compare can have word and byte versions; Logical instructions can have bit and byte versions.

**Branches—Unconditional**; **Simple Conditional Branches**; **Signed Conditional Branches** (for testing values of 2's complement arithmetic); and **Unsigned Conditional Branches** (for testing results of comparing unsigned operands).

**Subroutine Instructions—e.g., Jump to Subroutine, Mark, and Return from Subroutine.**

**Program Control—e.g., Jump, Subtract One, and Branch.**

**Traps—These are calls to emulators, I/O monitors, debuggers, and user-defined interpreters.**

**Miscellaneous—e.g., Halt, Wait, Reset.**

**Condition Code Operators—Set/Clear conditionally or unconditionally all of each of the four PDP-11 condition code bits.**

**ADDRESSING:** Eight address modes are provided, with each operand address consisting of three bits to specify address mode and three bits that specify the register used to calculate the address. The modes consist of Register (operand in register), Register Indirect (operand address in register), Auto Increment/Decrement (self-incrementing/decrementing operand address in register), Auto Increment/Decrement Indirect (self-incrementing/decrementing register which points to an address in memory), Indexed, and Indexed Indirect. The eight modes can allow a specific operation code (e.g., MOV, for move) to accomplish register/register, register/memory, memory/memory, memory/stack, and register/stack manipulation.

**DISKETTE DRIVE (PDT-11/150 only):** The dual diskette drives are housed with the LSI-11 processor in a separate cabinet from other system components. Each drive accommodates eight-inch diameter diskettes recorded with 77 tracks in IBM 3740 format, single side. Average access time for each diskette is 488 milliseconds.

The dimensions of the diskette unit are 20.08 inches deep, 13.0 inches wide and 13.42 inches high.

The front panel of the diskette unit has indicator lights which show various operating conditions. One shows when a system error occurs in self-test mode, another shows that the LSI-11 microprocessor is executing instructions, another shows the presence of dc power, and another shows that the system is waiting for a response from the console terminal. Two of the indicator lights are available to the user program.

**DECtape II MINICARTRIDGES (PDT-11/130 only):** This is a mass memory magnetic tape subsystem consisting of two cartridge transports, capable of reading and writing a total of 512K bytes of data on pre-formatted, block-addressable cartridges at 800 bits per inch. The system stores information at fixed positions on the tape rather than at unknown or variable positions as in conventional magnetic tape recording. Thus, the tape is used much like a disk. Data blocks can be read or written over in random fashion without disturbing previously recorded information. The average search time for any record is 10 seconds.

**KEYBOARD/PRINTER:** A DECwriter teleprinter terminal may be used as a slave PDT-11 printer, a PDT-11/150 console, or an additional PDT-11 workstation attached via the optional cluster controller. The DECwriter III (LA120) prints at 180 cps. The DECwriter IV (LA38) prints at 10 or 30 cps.

## SOFTWARE

The PDT-11/130 and /150 utilize the RT<sup>2</sup>/PDT operating system, which is a run-time subset of RT-11, an operating system developed for the PDT-11 Series of computers. RT<sup>2</sup>/PDT features include monitors, handlers, and utilities that supervise the PDT-11's operation and support execution of RT-11 applications. RT<sup>2</sup>/PDT can support both single-job and foreground/background modes of operation. The single-job version requires 16K bytes of memory; the two-partition version, 32K bytes of memory.

The PDT-11/130 and /150 support MACRO-11, FORTRAN-IV, APL-11, BASIC-11, and MU BASIC-11 (PDT-11/150 only) programming languages, as well as the FMS-11 forms development language, which can be used to develop video form applications packages for data entry and display. Programs are developed on any full RT-11 system, then down-line loaded into mass storage for later execution.

Either of two IBM 2780/3780 emulation software packages, PDT-11 2780/3780 PE and RT-11/2780, allows the PDT-11/130 and /150 to communicate with an IBM host as an RJE terminal.

The PDT-11/130 can support either DECnet-11S or DECnet-RT for DEC network communications. The PDT-11/150 supports only DECnet-RT.

The PDT-11/110, which contains no local mass storage, utilizes the RSX-11S operating system, a run-time version of RSX-11M. DECnet-S is also supported.

The Datasystem 150 runs on the CTS-300 commercial operating system, which supports the DIBOL programming language, the DICAM 3271 emulator, the CTS-300/2780 and

Digital Equipment Corporation  
 PDT-11 Terminal Family

► RDCP 2780/3780 RJE communications packages, and DECFORM, a utility for interactive data entry, file maintenance, and file inquiry tasks. Optional programming languages include BASIC-11, FORTRAN-IV, APL-11, and the FMS-11 forms development language. DECnet-RT is also supported.

PRICING

PDT-11 terminals are available from Digital Equipment for purchase only. The company will provide maintenance on purchased units or units leased from third parties. Quantity discounts are available.

|   | <u>Purchase</u> | <u>Monthly Maint.</u> |
|---|-----------------|-----------------------|
| PDT-11/110 with—  |                 |                       |
| 32K RAM   | \$ 4,800        | \$42                  |
| 60K RAM   | 5,800           | 42                    |
| PDT-11/130 with—  |                 |                       |
| 32K RAM   | 6,000           | 59                    |
| 60K RAM   | 6,700           | 59                    |
| 60K RAM and cluster controller option                     | 7,000           | 59                    |
| PDT-11/151 with—  |                 |                       |
| 32K RAM   | 8,600           | 62                    |
| 60K RAM   | 9,300           | 62                    |
| 60K RAM and cluster controller option                     | 9,500           | 62                    |
| PDT-11/152 with—  |                 |                       |
| 32K RAM   | 9,600           | 75                    |
| 60K RAM   | 10,400          | 75                    |
| 60K RAM and cluster controller option                     | 10,600          | 75                    |
| PDT-11/153 with—  |                 |                       |
| 32K RAM   | 8,100           | 61                    |
| 60K RAM   | 8,900           | 61                    |
| 60K RAM and cluster controller option                     | 9,100           | 61                    |
| Datasystem 150; includes single-use software license and— |                 |                       |
| 32K RAM, but no software support                          | 8,900           | 66                    |
| 32K RAM and software support                              | 12,100          | 66                    |
| 60K RAM, but no software support                          | 9,700           | 66                    |
| 60K RAM and LA120 printer, but no software support        | 12,500          | 92                    |
| 64K RAM and software support                              | 12,900          | 66                    |
| 64K RAM, LA120 printer, and software support              | 15,700          | 92■                   |

# Digital Equipment Corporation PDT-11 Terminal Family

## MANAGEMENT SUMMARY

The PDT-11 series of terminals is another link in the Digital Equipment chain of products that provides users of distributed systems with virtually every piece of hardware that they require.

DEC can provide the central site computer with its complement of disk drives, tape drives, and printers. The company offers the most complete line of minicomputers available from any manufacturer for remote processing. DEC also has been manufacturing CRT displays and teleprinters since 1975 and has an installed base of teleprinter terminals second only to IBM and Teletype. Tying all of these components together is the Digital Network Architecture (DNA) and DECnet, the company's approach to communications networks which include a series of software products to provide for extremely flexible controls and operations (see Report C11-384-101).

The PDT-11 series is DEC's first user-programmable terminal family. The processor employed is the LSI-11, a Digital Equipment-manufactured microprocessor that is compatible with the company's popular PDP-11 minicomputer. Consequently, users of the PDP-11 who are looking for a user-programmable terminal will naturally lean toward this latest DEC offering, which uses the RT-11 operating system developed for the PDP-11. (RSX-11S for the PDT-11/110).

The man/machine interface for the terminal family is DEC's VT-100 CRT display terminal. Two versions of the PDT-11 family (the 11/110 and 11/130) have the processor housed within the cabinet of the VT-100. The PDP 11/130 provides up to 512K bytes of mass storage via twin minicassette tape drives built into the display monitor cabinet.

The PDT 11/150 has the processor housed in a separate cabinet which also houses one or two diskette drives. The diskettes accommodated are single sided, IBM 3740 com-

A family of user-programmable terminals based on the DEC LSI-11 microprocessor and utilizing the VT-100 display terminal as the operator interface.

All models are available with up to 64K bytes of RAM high speed memory. The PDT 11/130 also provides up to 512K bytes of mass storage via twin tape cartridges. The PDT 11/150 provides up to 512K bytes of mass storage via two floppy disks.

The PDT series of terminals is available for purchase only. A single PDT 11/110 with 16K bytes of memory sells for \$3,900. A PDT 11/150 with 60K bytes of RAM and twin diskette drive sells for \$8,695. Quantity discounts are available.

## CHARACTERISTICS

**VENDOR:** Digital Equipment Corporation, 146 Main Street, Maynard, MA 01754. Telephone (617) 897-5111.

**DATE OF ANNOUNCEMENT:** May 1978.

**DATE OF FIRST DELIVERY:** June 1978 (limited).

**NUMBER DELIVERED TO DATE:** Information not available.

**SERVICED BY:** Digital Equipment Corporation.

## CONFIGURATION

The PDT-11 Terminal Family is a group of compatible terminal components ranging from a single CRT keyboard display station with integrated processor, up to a multiple station cluster with 60K bytes of memory, dual diskette drive storage, and a serial printer. All units are compatible with the DEC PDP-11 series of computers.

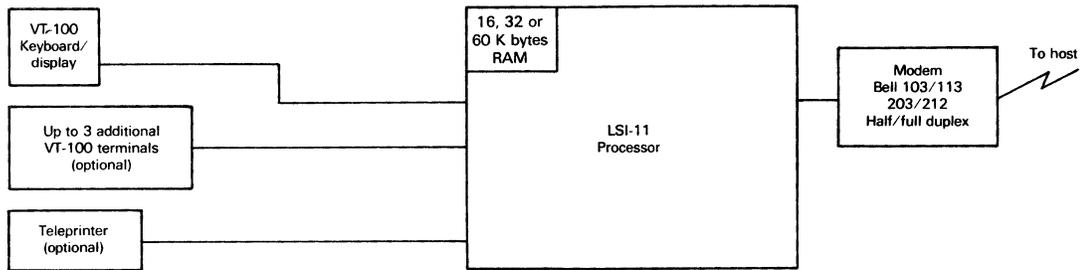


The PDT 11-150 shown here with dual diskette drives on the left is the top of the line of Digital Equipment's user-programmable terminal family. All models employ the LSI-11 microprocessor, making them fully compatible with the DEC PDP-11 minicomputer series.

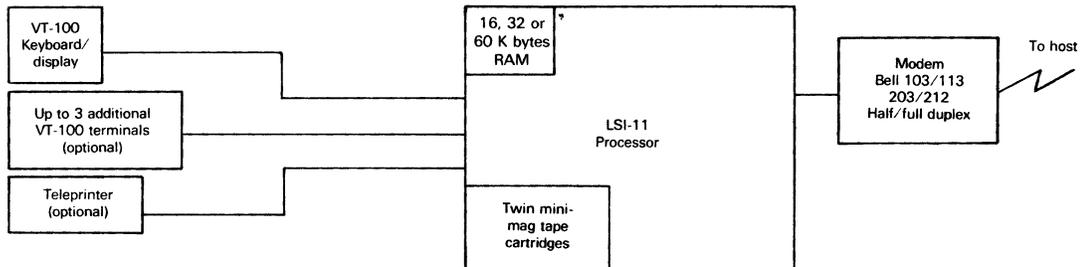
## Digital Equipment Corporation PDT-11 Terminal Family

### Configurations

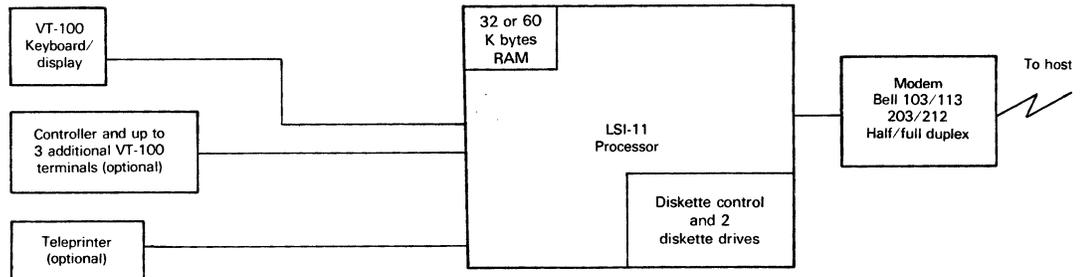
PDT 11/110



PDT 11/130



PDT 11/150



- ▶ compatible, 8-inch diameter removable platters, each of which contains 77 tracks and stores 256K bytes for a total of 512K bytes of diskette storage.

Deliveries of the PDT-11 family are being made currently. □

- ▶ **PDT-11/110:** This is a VT 100 Terminal to which has been added an LSI-11 microprocessor, up to 60K bytes of random access memory, ports for synchronous or asynchronous communications with a host system, a port for a local printer and interfaces for up to three additional VT 100 terminals or hard copy terminals. User programs may be automatically loaded from a DEC host processor or from a user selected host via user provided software.

**PDT-11/130:** This is a VT 100 Terminal with all of the features of the PDT-11/110. In addition, the 130 is equipped with dual integrated minicartridge magnetic tape drives which provide up to 512K bytes of mass storage.

**PDT-11/150:** This is a VT 100 Terminal and a separate desktop cabinet which houses the LSI-11 processor, and two diskette drives on which is stored up to 512K bytes of RAM storage. The 150 also has up to 60K bytes of semiconductor memory and three ports on the terminal. One of

the ports connects the terminal to a communications line. One is used to connect a local serial printer. The third is used to connect a video or hard copy terminal. An optional cluster controller permits attaching three additional VT 100 or other EIA compatible video or teleprinter terminals.

### TRANSMISSION SPECIFICATIONS

The PDT-11 terminal family operates on full-duplex synchronous or asynchronous communication lines at switch selectable speeds ranging from 50 to 9600 bps. Parity is also switch selectable. An EIA RS 232C interface is standard on all models.

### COMPONENTS

**CRT DISPLAY:** The VT 100 Terminal (Report C25-384-101) is a detached keyboard/CRT display featuring a 132 character line with blinking, underlining, double intensity and normal or reverse video as standard features. Characters are formed in a 7x9 dot matrix and double width and double height characters may also be displayed. A divided screen permits prompting to be displayed independently of keyed data.

The detachable keyboard is provided with a six foot coil cord. In addition to the typewriter keys there is an 18-key numeric/function keypad which provides calculator-style numeric entry and single keystroke entries for program controlled

Digital Equipment Corporation  
 PDT-11 Terminal Family

► application functions. The power supply included in the basic VT100 is adequate to power any of the available options so that field upgrading is simplified.

**PROCESSOR:** The processor in all PDT-11 terminals is the DEC LSI-11, a microprocessor version of the DEC PDP-11 and fully compatible with that system.

The LSI-11 Processor has a cycle time of 1.2  $\mu$ sec. and a maximum data transfer rate of 1666K bytes/second. It has a repertoire of 66 instructions, which are classified as follows:

**Single Operand Instructions—General** (e.g., clear, increment, decrement, complement, negate, test); **Shifts;** **Multiple Precision** (e.g., add and subtract with carry, extend sign); and **Rotate**. Many of these instructions have word and byte operand versions.

**Double Operand Instructions—General** (e.g., storage-to-storage move, add, subtract, compare); **Register Destination** (e.g., multiply, divide, Exclusive OR); and **Logical**. Move and Compare can have word and byte versions; logical instructions can have bit and byte versions.

**Branches—Unconditional;** **Simple Conditional Branches;** **Signed Conditional Branches** (for testing values of 2's complement arithmetic); and **Unsigned Conditional Branches** (for testing results of comparing unsigned operands).

**Subroutine Instructions—e.g., Jump to Subroutine, Mark, and Return from Subroutine.**

**Program Control—e.g., Jump, Subtract One and Branch.**

**Traps—These are calls to emulators, I/O monitors, debuggers, and user-defined interpreters.**

**Miscellaneous—e.g., Halt, Wait, Reset.**

**Condition Code Operators—Set/Clear conditionally or unconditionally all of each of the four PDP-11 condition code bits.**

**ADDRESSING:** Eight address modes are provided, with each operand address consisting of three bits to specify address mode and three bits that specify the register used to calculate the address. The modes consist of **Register** (operand in register), **Register Indirect** (operand address in register), **Auto Increment/Decrement** (self-incrementing/decrementing operand address in register), **Auto Increment/Decrement Indirect** (self-incrementing/decrementing register which points to an address in memory), **Indexed**, and **Indexed Indirect**. The eight modes can allow a specific operation code (e.g., MOV, for move) to accomplish register/register, register/memory, memory/memory, memory/stack, and register/stack manipulation.

**DISKETTE DRIVE:** The dual diskette drives are housed in a separate cabinet which accommodates eight inch diameter diskettes recorded with 77 tracks in IBM 3740 format, single side. Average access time for each diskette is 488 milliseconds.

The dimensions of the diskette unit are 20.08 inches deep, 13.0 inches wide and 13.42 inches high.

The front panel of the diskette unit has indicator lights which show when a system error occurs in self-test mode, another which shows that the LSI-11 microprocessor is executing instructions, another which shows the presence of dc power, and another which shows that the system is waiting for a response from the console terminal. Two of the indicator lights are available to the user program.

**DECTAPE II MINICARTRIDGES:** This is a mass memory magnetic tape subsystem consisting of two cartridge transports, capable of reading and writing a total of 512K bytes of data on pre-formatted, block-addressable cartridges at 800 bits per inch. The system stores information at fixed positions on the tape rather than at unknown or variable positions as in conventional magnetic tape recording. Thus, the tape is used much like a disk. Data blocks can be read or written over in random fashion without disturbing previously recorded information. The average search time for any record is 10 seconds.

**KEYBOARD PRINTER:** The Digital Equipment DECwriter 11 with switch selectable print speeds of 10, 15, or 30 characters per second and DECwriter III with a print speed of 180 characters per second, can be included in the PDT 11 configuration to provide printed output. These machines are described in detail in report C27-384-101 (DECwriter II) and C27-384-201 (DECwriter III).

**SOFTWARE**

The LSI-11 processor utilizes the RT-11 operating system which was developed for the PDP-11 Series of computers and which has been running on them for years. This system can support both single-job and foreground/background modes of operation. The single-job version requires a 16K byte memory, and the two-partition version requires a 32K byte memory. RT-11 supports both FORTRAN IV and BASIC languages for program development.

The PDT-11/110, which has no mass storage associated with it, is supported by RSX 11S and DECnet S.

**PRICING:** PDT-11 terminals are available from Digital Equipment for purchase only. The company will provide maintenance on purchased units or units leased from third parties. A variety of maintenance plans is available.

|             | Purchase Prices |                |                 |
|-------------|-----------------|----------------|-----------------|
|             | Quantity<br>1   | Quantity<br>50 | Quantity<br>100 |
| PDT 110 16K | \$3,900         | \$2,925        | \$2,890         |
| 32K         | 4,200           | 3,150          | 3,020           |
| 60K         | 4,900           | 3,675          | 3,595           |
| PDT 130 16K | 5,000           | 3,750          | 3,677           |
| 32K         | 5,300           | 3,975          | 3,857           |
| 60K         | 6,000           | 4,500          | 4,382           |
| PDT 150 32K | 7,995           | 5,995          | 5,470           |
| 60K         | 8,695           | 6,520          | 5,946■          |

