DEC PDP-11 Family

UPDATE: *Digital continues to market the PDP-11 Family, which has an installed base of over 364,000 systems worldwide, according to estimates from International Data Corporation (IDC), a market research firm based in Framingham, Massachusetts. In the last few years, though, the MicroVAX—which provides full software compatibility with Digital's flagship VAX superminis—has replaced the PDP-11 as Digital's strategic low-end system. Thus, even though Digital has promised to support the PDP-11 for the next 10 years, the family's future and desirability are obviously limited. Because of the significant installed base of the PDP-11 Family, however, Datapro continues to present system characteristics and the latest available CPU prices.*

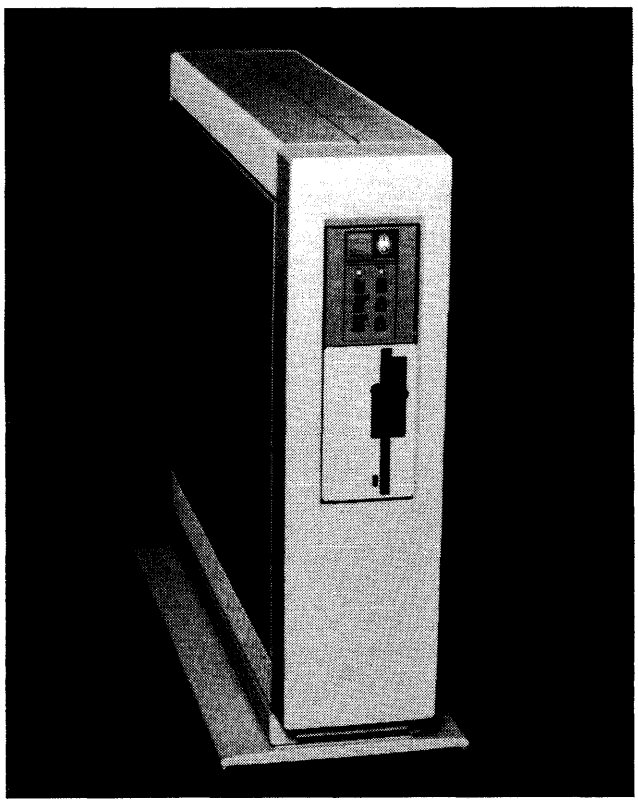
Digital Equipment Corporation's PDP-11 Family is a line of general-purpose, 16-bit computer systems comprising a traditional minicomputer—the PDP-11/84—and the four low-end supermicros that make up the MicroPDP-11 group. These systems are targeted for a broad range of applications in both commercial and industrial environments. They feature peripheral compatibility with Digital's VAX superminis and MicroVAX supermicros.

MODELS: MicroPDP-11/53, -11/53 Plus, -11/73, -11/83; PDP-11/84.
MEMORY: 512K bytes to 4M bytes.
DISK CAPACITY: 20M bytes to 3.6G bytes.
WORKSTATIONS: Up to 120 (48 concurrently active).
PRICE: $8,720 to $28,500 (base system prices).

CHARACTERISTICS

MANUFACTURER: Digital Equipment Corporation (DEC), 146 Main Street, Maynard, Massachusetts 01754-2571. Telephone (617) 897-5111.

CANADIAN ADDRESS: Digital Equipment of Canada, Ltd., P.O. Box 13000, 100 Herzberg Road, Kanata, Ontario, Canada K2K 2A6. Telephone (613) 592-5111.



The MicroPDP-11/53 is typical of the downscaling that has occurred in the PDP-11 Family: the conventional minicomputers that used to comprise the product line have been repackaged as low-end multiuser microcomputers. The BA23 pedestal enclosure shown here is shared by MicroPDP-11, MicroVAX, and VAXstation systems.

DATA FORMATS

BASIC UNIT: 16-bit word plus two parity bits. The processor can also handle eight-bit bytes and is capable of bit manipulation.

FIXED-POINT OPERANDS: Six-bit words or eight-bit bytes are used as operands in both single- and double-operand instructions. Bit manipulation is provided through Boolean AND/OR instructions.

FLOATING-POINT OPERANDS: 64-bit double-precision operands with an 8-bit exponent and signed 56-bit fraction. Single- and double-precision hardware via a floating-point processor are optionally available. This hardware includes a dedicated set of six 64-bit accumulators. ROM implementation of the extended instruction set (EIS) is also available. Floating-point software subroutines are included in the microcode of all PDP-11s.

INSTRUCTIONS: PDP-11 instructions are 16 bits long. If program counter addressing is employed, an additional 16 bits are added to the instruction length. Instruction formats are numerous, varying from one PDP-11 model to another. Common formats throughout the PDP-11 line occur in instructions of the single operand group, the double operand group, branch group, subroutine return, and condition code operators group. Operation codes vary from 4 bits to 16 bits in length.

INTERNAL CODE: ASCII for text-oriented data; binary for calculations.

MAIN STORAGE

TYPE: Storage types include Parity MOS on the MicroPDP-11/53, -11/53 Plus, and -11/73 and error correcting and checking (ECC) MOS on MicroPDP-11/83 and PDP-11/84.

DEC PDP-11 Family

CHART A. SYSTEM COMPARISON

MODEL	MicroPDP-11/53, -11/53 Plus	MicroPDP-11/73	MicroPDP-11/83	PDP-11/84
SYSTEM CHARACTERISTICS				
Date of introduction	6/86	7/84	11/85	4/85
Date of first delivery	6/86	9/84	12/85	5/85
Operating system	RSX-11M-Plus; RSX-11M; RSX-11S; Micro/RSX; RSTS/E; Micro/RSTS; RT-11; CTS-300; MicroPower/Pascal; DSM-11	RSX-11M-Plus; RSX-11M; RSX-11S; Micro/RSX; RSTS/E; Micro/RSTS; RT-11; CTS-300; MicroPower/Pascal; DSM-11	RSX-11M-Plus; RSX-11M; RSX-11S; Micro/RSX; RSTS/E; Micro/RSTS; RT-11; CTS-300; MicroPower/Pascal; DSM-11	RT-11; RSX-11S; RSX-11M; RSX-11M-Plus; RSTS/E; DSM-11
Upgradable from	Not applicable	MicroPDP-11/23, -11/23 Plus	MicroPDP-11/23, -11/23 Plus, -11/73	PDP-11/04, -11/24, -11/34, -11,44, -11/70
Upgradable to	MicroVAX II	MicroPDP-11/83, MicroVAX II	MicroVAX II	Not applicable
Relative performance (based on a rating of the 11/70 at 1.0)	0.5 on -11/53; 0.65 on -11/53 Plus	0.7	1.2	1.2
MEMORY				
Minimum capacity, bytes	512K on -11/53; 1.5M on -11/53 Plus	1M	2M	2M
Maximum capacity, bytes	4M	4M	4M	4M
Type	Parity MOS	Parity MOS	ECC MOS	ECC MOS
Cache memory	None	8KB	8KB	8KB
Cycle time, nanoseconds	267	267	222	222
Bytes fetched per cycle	2	2	2	2
INPUT/OUTPUT CONTROL				
High-speed buses	None	None	None	None
Low-speed buses	1 (Q-bus)	1 (Q-bus)	1 (Q-bus)	1 (UNIBUS)
MINIMUM DISK STORAGE	20MB on -11/53; 42MB on -11/53 Plus	71MB	159MB	456MB
MAXIMUM DISK STORAGE	360MB on -11/53; 402MB on -11/53 Plus	1.38GB	1.8GB	4.8GB
NUMBER OF WORKSTATIONS[1]	26 (8 active)	41 (12 active)	65 (30 active)	120 (48 active)
COMMUNICATIONS PROTOCOLS	Ethernet; DNA; HDLC/SDLC; X.25; 2780/3780; 3271	Ethernet; DNA; HDLC/SDLC; X.25; 2780/3780; 3271	Ethernet; DNA; HDLC/SDLC; X.25; 2780/3780; 3271	Ethernet; DNA; HDLC/SDLC; X.25; 2780/3780; 3271
PURCHASE PRICE	From $8,720	From $11,141	From $13,500	From $25,200

[1]With cable concentrator.

CYCLE TIME: See Chart A for information on each model.

CAPACITY: Main memory ranges from 512K bytes to 4M bytes. See Chart A for memory capacities of specific models. Parity MOS increment sizes are 1M bytes and 2M bytes. (A 4M-byte option is available for field installation only.) ECC MOS memory is available in 1M-byte and 2M-byte increments.

CHECKING: Parity on the basis of one bit per byte is available with dynamic MOS memory for the MicroPDP-11/53, -11/53 Plus, and -11/73. Error correcting and checking are features of dynamic MOS memory for the MicroPDP-11/83 and the PDP-11/84. ECC corrects all single-bit errors and detects all double-bit errors, as well as most multiple-bit errors.

STORAGE PROTECTION: This function is handled through the memory management facilities on all PDP-11s. Mapping automatically provides hardware storage protection.

RESERVED STORAGE: The uppermost 8192 bytes on the PDP-11/84 are reserved for I/O registers.

All PDP-11s reserve at most 511 locations at the low end of memory for interrupt vectors, trap vectors, and floating vectors, which are assigned for communications and other devices that interface with the PDP-11.

CACHE MEMORY: The MicroPDP-11/73, the MicroPDP-11/83, and the PDP-11/84 have integral cache memories of 8K bytes.

CENTRAL PROCESSOR

GENERAL: The CPU used in the MicroPDP-11/53, -11/53 Plus, and -11/73 is a multifunction module. It includes Digital's proprietary 15MHz J-11 microprocessor chip set (instruction set processor and memory management unit), one or two asynchronous serial lines (one on the -11/73 and two on the -11/53 and -11/53 Plus), line frequency clock, 32K-byte bootstrap/diagnostic ROM, and 2K-byte electrically erasable ROM. The MicroPDP-11/73 includes an 8K-byte direct-mapped, write-through cache memory.

The CPU used with the MicroPDP-11/83 includes a faster, 18MHz version of the J-11 chip set (instruction set processor and memory management unit), an asynchronous serial line, line frequency clock, 32K-byte bootstrap/diagnostic ROM, 2K-byte electrically erasable ROM, and a serial line unit for the console terminal. The MicroPDP-11/83 also includes a floating-point accelerator chip with a private memory interconnect (PMI) for enhanced performance, as well as an 8K-byte direct-mapped, write-through cache memory.

DEC PDP-11 Family

The instruction set processor of the MicroPDP-11 systems offers a standard 91-instruction set and a floating-point instruction set. The memory management unit executes instructions in kernel, supervisor, and user modes and includes separate addressing space for instructions and data.

The PDP-11/84 CPU is an 18MHz, J-11-based, single-board processor that executes arithmetic and control logic operations to produce fixed-point arithmetic, hardware multiply and divide, and extensive test and branch instructions. The PDP-11/84 also features an asynchronous serial line for attachment of a console unit, a 32K-byte bootstrap/diagnostic ROM, a program-controlled realtime clock, and an 8K-byte cache memory. The unit also includes a floating-point co-processor.

The integral memory management unit of the PDP-11/84 provides additional capabilities and protection in a multiprogramming environment. It assigns memory pages to user programs and prevents users from unauthorized access to pages outside their own area. Memory management also permits kernel and user modes to relocate individually anywhere in physical memory, allowing context switching to occur. Additionally, pages of memory may be constrained for either read-only access or nonaccess operations. Also, 16-bit, 18-bit, or 22-bit translation is offered to ensure compatibility with other members of the PDP-11 family.

REGISTERS: The MicroPDP-11/53, -11/53 Plus, and -11/83 have nine general-purpose registers. Three of these are used as the program counter, the processor stack pointers, and the processor status word.

The MicroPDP-11/73 and the PDP-11/84 have two sets of general-purpose registers, with six registers to a set, along with three stack pointers and a program counter.

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 are Register (operand in register); Register Indirect (operand address in register); Auto Increment/Decrement (self-incrementing/decrementing operand address in register); Auto Increment/Decrement Indirect (a self-incrementing/decrementing register that points to an address in memory); Indexed; and Indexed Indirect. The eight modes can allow a specific operation code to accomplish register-to-register, register-to-memory, memory-to-memory, memory-to-stack, and register-to-stack manipulation.

INTERRUPTS: All PDP-11 models have four automatic hardware priority level interrupts.

OPERATING ENVIRONMENT: All MicroPDP-11s come in rackmount and tabletop enclosures. The rackmount enclosure is 5.25 inches high, 19 inches wide, and 25.5 inches deep (13.3 cm by 48.3 cm by 64.8 cm); the tabletop model is 6 inches high, 21.5 inches wide, and 28.5 inches deep (15.2 cm by 56.5 cm by 72.4 cm). The tabletop models each weigh 70 pounds (31.5 kg); the rackmount model weighs 55 pounds (24.8 kg).

The MicroPDP-11/73 and -11/83 are also available in floorstanding configurations. Both are available in a floorstanding box 24.5 inches high by 10 inches wide by 28.5 inchesdeep(62.2cmby25.4cmby72.4cm).TheMicroPDP-11/83 also comes in a 42-inch-high cabinet or in a floorstanding box 27 inches high, 21 inches wide, and 17.8 inches deep (67.5 cm by 53 cm by 45 cm).

Power requirements for the MicroPDP-11s are 120 VAC, 88 to 128 VRMS, 60 Hz, 1-phase or 240 VAC, 176 to 256 VRMS, 50 Hz, 1-phase. Permissible operating temperatures range from 41 degrees to 122 degrees Fahrenheit (5 degrees to 50 degrees Celsius) at 20 percent to 80 percent relative humidity.

The basic configuration unit of the PDP-11/84 is the kernel system, a 19-inch- (48.2-cm) wide, rackmountable unit available in two types of enclosures: 5.25 inches (13.3 cm) high by 26 inches (66 cm) deep or 10.5 inches (26.6 cm) high by 27 inches (68.6 cm) deep. The CPU box weighs 98 pounds (44.5 kg). PDP-11/84 power requirements are 120 VAC, 90 to 132 VRMS, 47 to 63 Hz, 1-phase or 240 VAC, 180 to 264 VRMS, 47 to 63 Hz, 1-phase. Permissible operating temperatures range from 50 degrees to 122 degrees Fahrenheit (10 degrees to 50 degrees Celsius) at 10 percent to 95 percent relative humidity.

The PDP-11/84 kernel systems can be incorporated into three types of cabinets: H9642 or H9645, measuring 42 inches high by 19 or 23 inches wide (105 cm by 47.5 or 57.5 cm), or H9647, measuring 60.5 inches high by 27 inches wide (151.3 cm by 67.5 cm). A PDP-11/84 configured in the H9647 cabinet is referred to as a PDP-11/84E. (Note: the H9647 requires 3-phase power.)

INPUT/OUTPUT CONTROL

I/O control on the PDP-11/84 is handled through the *UNIBUS*, a bidirectional, asynchronous interconnect providing a single common data path that treats all components—processor, memory modules, and peripheral controllers—as equal-level devices for data accesses and transfers. The priority of any device connected to the UNIBUS is determined by its physical position; hence, the processor is normally attached to give it the highest priority.

I/O control on the MicroPDP-11 computers is handled by the *Q-bus* (also employed on Digital's MicroVAX and VAXstation systems), which provides a common communications path for the data, address, and control information passed among the CPU, memory, and device interfaces. The Q-bus provides 22-bit addressing and four interrupt levels; it also performs block-mode direct memory access (DMA) data transfers on a bandwidth of up to 3M bytes per second.

CONFIGURATION RULES

GENERAL: The extent to which a PDP-11 system can be configured varies from model to model, depending upon the amount of expansion space available in CPUs and expansion cabinets, as well as on the operating system employed. The PDP-11 systems are available in a variety of basic configurations. The two most common types of packages, however, are System Building Blocks and Standard Systems.

System Building Blocks (SBBs) include the CPU, base memory, and cabinetry. They require a selection from the integrated mass storage device and base system software menus. Selections from the diagnostics/documentation, additional memory, terminal/printer (for at least a console device), communications/networking, and hardware/software maintenance services menus are optional.

Standard Systems, based on SBBs, include basic mass storage devices. The purchaser must make a selection from the base system software menu. Selections from the diagnostics/documentation, additional memory, additional

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mass storage, terminal/printer, communications/networking, and hardware/software maintenance services menus are optional.

The MicroPDP-11 systems are available in various enclosures. All MicroPDP-11 systems are available in the eight-slot BA23 box in both rackmount and floorstanding/pedestal versions. The MicroPDP-11/73 and -11/83 are available as well in the larger, caster-mounted BA123 floorstanding enclosure. The MicroPDP-11/83 also comes in the caster-mounted BA213 enclosure or in the larger H9642 cabinet, which accommodates two BA23 enclosures.

The BA23 enclosure can internally accommodate one full-height 159M-byte RD54 or 71M-byte RD53 fixed disk drive or two half-height 42M-byte RD32 or 20M-byte RD31 fixed disk drives; in addition, the BA23 can hold two half-height 1.2M-byte RX33 diskette drives or one 800K-byte RX50 diskette or 95M-byte TK50 streaming cartridge tape drive.

The 12-slot BA123 package accommodates up to four 5.25-inch storage devices, including the RD54, RD53, RX50, RX33, and TK50. A maximum of three RD54 or RD53 disk drives can be configured in the chassis.

The BA213, which also offers 12 slots, accommodates one TK50 tape drive and up to three RD54 or RD53 fixed disk drives.

Two BA23 enclosures configurable in the 14-slot H9642 cabinet package can accommodate a total of four 5.25-inch storage devices, including up to two RD54 or RD53 disk drives and up to two RX50 diskettes or TK50 tapes. Up to four RX33s can be accommodated, depending upon the other devices in the configuration. The H9642 cabinet also provides space for two 10.5-inch storage devices, including the 205M-byte RA60 removable and 456M-byte RA81 fixed disks and the 40M-byte TS05 tape drive.

The MicroPDP-11 configurations can be expanded to include tabletop or rackmount versions of the storage devices.

The PDP-11/84 is available in H9642 single-body, H9645 wide-body, and H9647 "four-high" cabinets (the last of which provides up to 27 slots). The H9647, which houses the so-called PDP-11/84E configurations, provides space for up to two 10.5-inch mass storage devices; the lower half accommodates the CPU and a 10.5-inch expansion box. Additional H964X series expansion boxes can be employed to boost the storage capacities of the PDP-11/84.

WORKSTATIONS: Generally, up to 14 stations can be configured on PDP-11 systems running Micro/RSX and Micro/RSTS; up to 16 workstations can be configured on systems running under RT-11, RSX-11S, RSX-11M, and RSX-11M-Plus operating systems. Theoretically, up to 127 terminals can be configured on RSTS/E-based systems; however, 120 is the maximum number of terminals configurable on any current PDP-11 system.

The number of concurrently operating terminals supported can vary, depending upon the application. The MicroPDP-11/53 and -11/53 Plus support up to eight concurrently active users. The MicroPDP-11/73 accommodates up to 12 concurrently active workstations. The MicroPDP-11/83 supports 30 simultaneously active stations, and the PDP-11/84 supports up to 48 concurrently active users.

The PDP-11 systems support Digital's VT300 series terminals; details on those devices are provided in the "DEC VAX Systems" report in *Datapro Reports on Minicomputers.*

DISK STORAGE: The MicroPDP-11/53 and -11/53 Plus support the 52M-byte RC25 fixed/removable disk and the 42M-byte RD32, 71M-byte RD53, and 159M-byte RD54 fixed disks. The RD54 is supported only as an external device on both systems; the MicroPDP-11/53 supports the RD53 only as an external device. The PDP-11/53 also supports the 20M-byte RD31 fixed disk and the 1.2M-byte RX33 diskette, while the -11/53 Plus supports the aged 10M-byte RL02 cartridge drive.

The MicroPDP-11/73 supports the RC25 and the RD32, RD53, and RD54 fixed disks. It also allows configuration of the RX33 and 800K-byte RX50 diskettes.

The MicroPDP-11/83 supports the same disk drives and diskettes as the -11/73. In addition, it allows attachment of the higher performance 456M-byte RA81 fixed disk drive and the 205M-byte RA60 removable disk drive, which are both VAX-class storage devices.

The PDP-11/84 allows attachment of the RA81 fixed disk drive, the RA60 removable disk drive, and the RC25 fixed/removable drive; it also supports the old RA80 121M-byte fixed disk drive. In addition, the PDP-11/84 supports Digital's highest performance fixed disk drive, the 14-inch, 622M-byte RA82, which is available in both single-drive and multiple-drive permutations, including the 2.48G-byte, four-RA82 SA482 storage array.

See Chart A for the disk capacities of the individual PDP-11 systems. Specific details on these disk drives are included in the "DEC MicroVAX Family" and "DEC VAX Systems" reports in *Datapro Reports on Minicomputers.*

MAGNETIC TAPE: All PDP-11 systems support the TS05, a 40M-byte, 1600 bpi, nine-track, Phase Encoded (PE) streaming tape drive. All systems also support the TK50, a 95M-byte streaming cartridge tape drive.

The PDP-11/84 also supports two additional nine-track streaming tape drives: the TU81-Plus, a 40M-byte/145M-byte, 1600/6250 bpi, Phase Encoded/Group Coded Recording (PE/GCR) drive, and the TU80, a 40M-byte, 1600 bpi, PE drive. The maximum number of magnetic tape subsystems that can be attached to any single system is eight.

Full details on these tape systems are included in the "DEC MicroVAX Family" and "DEC VAX Systems" reports in *Datapro Reports on Minicomputers.*

PRINTERS: System printers supported by the PDP-11 computers include the LP25 (300-/215-lpm) and LP27 (1200-/800-lpm) band printers; the LG01 and LG02 (600-/480-lpm) matrix printers; the LXY12 (300-lpm) text/graphics printer; and the LN03 (8-ppm), LN03-Plus (8-ppm), and LPS40 (40-ppm) laser printers. Details on these printers may be found in the "DEC VAX Systems" report in *Datapro Reports on Minicomputers.*

Up to eight printers can be attached to RSTS/E-based systems. Only one printer can be attached to RT-11-, RSX-11S-, RSX-11M-, and RSX-11M-Plus-based systems.

PDP-11 systems also support a range of small printers, including the LCG01, a two ppm desktop inkjet color printer; the LA75, LA100, LA120, and LA210 dot matrix printers; and LJ250/LJ252 167 cps color text/graphics

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printers. Details on all these printers are provided in the "DEC MicroVAX Family" report in *Datapro Reports on Minicomputers.*

Also supported on the PDP-11s is the LQP45, a 45 cps daisywheel printer. This printer employs an RS-232-C interface. It replaces Digital's LQP02 daisywheel printer.

OTHER PERIPHERALS: The PDP-11 systems also support the DECtalk voice synthesis module. Details on DECtalk are included in the "DEC VAX Systems" report in *Datapro Reports on Minicomputers.*

COMMUNICATIONS CONTROL

A number of asynchronous, synchronous, and Ethernet communications devices are available for both Q-bus and UNIBUS PDP-11 systems.

The *DZQ11* is a four-line asynchronous multiplexer that provides local or remote interconnection between Q-bus PDP-11 systems and EIA RS-232-C/CCITT V.28 and EIA RS-423-A/CCITT V.10 terminals or other systems. The DZQ11 operates at program-selectable speeds up to 9600 bps full-duplex with limited modem control on each line.

The *DLVJ1* is a 4-line asynchronous interface that provides local or remote interconnection between Q-bus systems and EIA RS-232-C/CCITT V.28, EIA RS-422/CCITT V.11, and EIA RS-423/CCITT V.10 terminals. The DLVJ1 acts as four separate devices. It operates at program- or jumper-selectable speeds from 150 to 38.4K bps full duplex. Limited modem control is included.

The DZQ11 and DLVJ1 are compatible with Digital modems, as well as with Bell 100 and 200 series modems and their equivalents.

The *DEQNA* is an Ethernet-to-Q-bus synchronous communications controller which connects Q-bus systems to Ethernet local area networks. It operates at 10M bps and is supported under DECnet Phase IV software. DEQNA allows a system to communicate with up to 1,023 addressable devices on an Ethernet LAN.

The *DELUA* is a synchronous communications controller that connects UNIBUS PDP-11 systems to Ethernet V2.0 and IEEE 802.3 LANs. This microprocessor-based controller operates at 10M bps and provides 4M bps throughput.

The *H4000 Ethernet Transceiver* is a device that provides the functional interface between Ethernet coaxial cable and Ethernet nodes. The H4000 station transmits signals onto and receives signals from the cable and detects any message collisions that occur. The H4000 uses a tapping mechanism for physical connection to the cable.

The *DPV11* is a single-line synchronous interface that provides local or remote interconnection between Q-bus systems and other systems with EIA RS-232-C/CCITT V.28 or V.11 interfaces. The DPV11 operates at speeds up to 56K bps half or full duplex with full modem control. It is programmable for either byte-oriented protocols (DDCMP or Bisync) or bit-oriented protocols (SDLC or HDLC).

The *DMV11* is a microprocessor-controlled, single-line synchronous interface that provides local or remote interconnection between Q-bus systems and systems with EIA RS-232-C/CCITT V.28 or V.35 interfaces or with EIA RS-423/-449 interfaces. The DMV11 implements Digital's DDCMP protocol in hardware and supports DMA data transfers, DECnet point-to-point or multipoint configurations, and full modem control. It operates at speeds from 19.2K bps to 56K bps at half or full duplex.

The *KMV1A* is a DMA single-line programmable communications controller that provides interconnection between Q-bus systems with EIA RS-232-C/CCITT V.28, EIA RS-422/CCITT V.11, and EIA RS-423/CCITT V.10 interfaces. It can operate at speeds up to 64K bps. The KMV1A can be programmed in synchronous or asynchronous mode.

On a MicroPDP-11 system, the KMV1A performs user-defined communications functions, freeing the CPU for applications processing. The KMV1A supports Digital's VAX Packetnet System Interface (PSI) software at speeds up to 19.2K bps.

The DPV11, the DMV11, and the KMV1A are compatible with Digital modems and Bell 200 series and equivalent modems.

Digital offers three software packages specifically for the KMV1A communications processor. *Software Development Tools* enable end users to write layered telecommunications protocols. The package includes a linker and loader; a single-step, start, stop, and breakpoint program debugger; and extensive documentation. *HDLC Framing Software* provides a basic HDLC frame for multivendor environments and for applications requiring proprietary protocols. *X.25 Link Level Software* provides point-to-point communications between host processors. The software operates in full-duplex mode and implements the CCITT 1980 recommendations for X.25 LAPB Link Level Protocol. These products are available for the RSX-11S, RSX-11M, and RSX-11M-Plus operating environments.

The *DHU11* is a 16-line asynchronous DMA multiplexer that provides local and remote interconnection between UNIBUS systems and EIA RS-232-C/CCITT V.28 or EIA RS-423-A/CCITT V.10 terminals. The DHU11 operates at program-selectable speeds up to 38.4K bps, half or full duplex. Full modem control is available on all 16 lines.

The *DHQ11*, for Q-bus systems, provides eight asynchronous DMA communications lines. It supports RS-232-A signaling with modem control and RS-423 signaling without modem control. Software-programmable line speeds can reach 38.4K bps. The DHQ11 is supported by the RSX, MicroRSX, RSTS/E, and Micro/RSTS operating systems.

The *DMR11* network link is a single-line synchronous interface providing local and remote connections for UNIBUS systems with EIA RS-232-C/CCITT V.28, CCITT V.35, EIA RS-423/RS-449, or EIA RS-422/RS-449 interfaces. The DMR11 implements Digital's DDCMP protocol in hardware and can communicate with another DMR11 or synchronous interface implementing DDCMP. The DMR11, which can operate at speeds up to 1M bps half or full duplex, supports DMA transfers, DECnet point-to-point configurations, and full modem control. This device is compatible with Digital's family of modems, as well as with Bell 200 series and 500a 11/5 modems and their equivalents.

The *DUP11* is a single-line synchronous interface that provides local or remote interconnection between UNIBUS systems and other computer systems with RS-232-C/CCITT V.28 interfaces. The DUP11 operates at speeds up to 9600 bps half or full duplex with full modem control. The DUP11 is programmable for either byte-oriented protocols (DDCMP or Bisync) or bit-oriented protocols

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(SDLC or HDLC). The DUP11 is compatible with Digital modems and with Bell 200 series modems and their equivalents.

The *KMS11-BD/BE* is an eight-line, programmable, synchronous, intelligent front end that provides interconnection between UNIBUS systems and other devices with EIA RS-232-C/CCITT V.28 or CCITT V.35 (with optional hardware module) interfaces. It operates at speeds up to 56K bps half or full duplex with full modem control and supports DMA data transfers. (V.35 is required for 56K bps transmission.) The KMS11 supports X.25 Link Level software on four lines at 56K bps or on eight lines at 19.2K bps.

The *KMS1P* is a single-line, programmable, synchronous, intelligent communications controller that provides interconnection between UNIBUS systems with EIA RS-232-C/CCITT V.28, EIA RS-423-A/CCITT V.10, CCITT V.35, or RS-422-A/CCITT V.11 interfaces. This microprocessor-based device operates at speeds up to 64K bps half or full duplex with full modem control. The KMS1P supports DMA data transfers, Digital's VAX and RSX-11 PSI software packages, and RSX X.25 Link Level software.

SOFTWARE

OPERATING SYSTEMS: The major operating systems for the PDP-11 Family include the single-user RT-11 disk-based system; the RSTS/E resource-sharing, timesharing system; Micro/RSTS; and the RSX-11 realtime multiprogramming systems: RSX-11M, RSX-11M-Plus, RSX-11S, and Micro/RSX. Several special-purpose operating environments are also available, including DSM-11, CTS-300, and MicroPower/Pascal.

RT-11 is a compact, single-user, realtime operating system designed for interactive program development and online applications. Standard with all RT-11 systems are the Macro-11 assembly language, the KED keypad editor, and the EDIT text editor.

RT-11 supports both single-job and foreground/background processing modes. In foreground/background mode, up to seven jobs can execute simultaneously in the foreground while one executes in the background. Realtime functions take place in the foreground and have priority on system resources. Jobs that do not require critical response times, like program development, can be accomplished in the background whenever the foreground jobs cannot run.

Resource Sharing Timesharing System/Extended (RSTS/E) is an interactive, multiuser, time- and resource-sharing operating system. Standard with all RSTS/E systems are Basic-Plus and Basic-Plus editor, Macro-11 assembly language, RMS-11 (Record Management Services) data management subsystem, and PDP-11 Sort/Merge utility. RSTS/E supports up to 63 jobs and up to 127 concurrent terminals.

RSTS/E dynamically allocates system resources, such as processor time, memory space, file space, and peripherals on a best fit/best throughput basis. Performance and throughput management features include shared common code, shareable data, intertask communications, disk data cache, overlapped seeks, and file placement control.

RSTS/E uses the Digital Command Language (DCL), an interface specifically designed for users with limited computer knowledge; it is similar to the DCL implemented in Digital's VAX/VMS operating system.

Micro/RSTS is a prebuilt subset of RSTS/E. It supports system calls and programming facilities supported by RSTS/E. Micro/RSTS allows a maximum of 14 terminals and 20 jobs. Like RSTS/E, Micro/RSTS uses the DCL command language. Micro/RSTS does not support DECnet communications or batch processing due to storage limitations.

Micro/RSTS is available in two parts. The Base Kit, intended for use as an applications engine and for Basic-Plus development, includes the operating system configured for a MicroPDP-11, documentation, RSTS/E operating system utilities, Basic-Plus, RMS-11, EDT, Sort/Merge, RSX emulation, and RT emulation. The Application Development Kit, for which the Base Kit is required, provides support for developing applications using Macro-11 (included) and high-level compilers.

RSX-11M is a multiuser, multiprogramming, realtime operating system. Standard on all RSX-11M systems are the Macro-11 assembly language, text editors, a task builder (or linker), a symbol cross-reference processor, an interactive debugger, task memory dump facilities, and other utilities for program development and checkout. Two file access facilities are included: File Control Services (FCS) and RMS. FCS supports sequential and direct access to sequentially and randomly organized files. RMS supports sequential, relative, and multikeyed indexed sequential (ISAM) file organizations and provides sequential and direct access modes.

RSX-11M also supports the DCL interface to the operating system.

Because of its multiprogramming capabilities, RSX-11M permits realtime activities to execute concurrently with less time-critical activities, such as program development, text editing, and data management. RSX-11M provides the environment for development and execution of multiple realtime tasks with a priority-structured, event-driven scheduling mechanism. Program development and realtime tasks can execute concurrently in systems with at least 56K bytes of memory.

RSX-11M provides full support for DECnet Phase IV. (DECnet-RSX software must be purchased separately.) This operating system also supports remote command terminals attached to any RSX or VAX/VMS DECnet system. File interchange with other RSX or VAX/VMS systems does not require DECnet.

RSX-11M-Plus is a superset of the RSX-11M operating system. RSX-11M-Plus takes advantage of the expanded addressing capabilities of the newer, larger memory PDP-11s while maintaining the architecture of the RSX-11M operating system. RSX-11M-Plus provides facilities for batch job execution, interactive program development and execution, and timesharing. The system supports separate instruction and data spaces, allowing a user task to address up to 64K bytes of each simultaneously.

Terminals or terminal servers on an Ethernet can connect to RSX-11M-Plus on that Ethernet. For that capability, the RSX-11M-Plus system requires DECnet.

RSX-11S is a fully compatible subset of the disk-based RSX-11M operating systems. Designed for runtime execution of memory-based application programs, RSX-11S requires the support of a disk-based host system like RSX-11M, RSX-11M-Plus, or VAX/VMS for program development and system generation. RSX-11S has most of RSX-11M's features and supports all of the peripheral devices that are supported under RSX-11M.

DEC PDP-11 Family

Micro/RSX is an extended subset of the RSX-11M-Plus operating system for the MicroPDP-11 Family. Available on diskette or cartridge tape, Micro/RSX is pre-SYSGEN'ed and is customer installable (reportedly in less than an hour). Micro/RSX uses the DCL oprating system interface and allows user-written command language interpreters. It will run most programs written for RSX-11M or RSX-11M-Plus without modification.

Micro/RSX comprises two separate packages: the Base Kit and the Advanced Programmer's Kit. The Base Kit provides the RSX-11M-Plus executive, utilities, device drivers, and facilities for program development with high-level languages. Complete tutorial and reference documentation is also included. The optional Advanced Programmer's Kit includes the Macro-11 assembler, tools for developing privileged code or for systems programming (such as developing user-written device drivers), support for ANSI mag tape handling, point-to-point communications and file-transfer capabilities, and additional documentation.

Terminals or terminal servers on an Ethernet can connect to a Micro/RSX-based system on that network. For that capability, the Micro/RSX system must be configured with DECnet software.

DSM-11 is a multiuser data management system that consists of an interactive high-level programming language called Digital Standard Mumps, or DSM (based on the Massachusetts General Hospital Multiprogramming System). DSM is a data management facility and a timesharing executive. It is an extension of the ANSI X11.1 Mumps standard and is intended for use by programmers with little programming experience.

DSM-11 employs a hierarchical file structure that allows users to design data file organizations that suit the needs of a particular processing environment. Other features of the DSM-11 operating system are a high-performance data base handler; distributed data base management using multipoint Ethernet and point-to-point data links; online, high-speed data base backup; automatic powerfail restart capability; and hardware device error reporting, a system patching utility, and an executive debugger for system maintenance.

CTS-300 is a disk-based, single-user or multiuser operating system for commercial applications on MicroPDP-11 systems. CTS-300 applications are written in DIBOL, Digital's business-oriented language. The system comprises the following elements: the RT-11 operating system; a choice among three runtime systems: Single-User DIBOL (SUD), Timeshared DIBOL (TSD), and Extended Memory TSD (XMTSD); and utilities.

CTS-300 also features a DIBOL editor; an interactive command language; and Data Management Services (DMS), which handles sequential, random, or indexed sequential access method (ISAM) structured files.

MicroPower/Pascal is a modular operating system and software development package used to create Q-bus-based microcomputer applications on PDP-11 systems.

MicroPower/Pascal has two system environments: host and target. The host system creates and builds the software, and the target system executes it. The host system includes an extended realtime Pascal compiler, a symbolic debugger, build utilities, and an interface to the Macro-11 assembler. The target system includes a library of software modules for process synchronization, communications, scheduling, exception and interrupt handling, timer services, and device and file I/O. Each application is custom designed for its target system and includes the appropriate set of operating system services. The host, using the symbolic debugger, controls the execution of the target application during development.

Four MicroPower/Pascal products are available for the PDP-11 systems: MicroPower/Pascal-RT, -RSX, -Micro/RSX, and -VMS.

DATABASE MANAGEMENT SYSTEMS: PDP-11 systems do not employ separate data base management systems. Data and file management facilities are built into most of the operating systems. Several information management applications are available for the PDP-11 Family; they are discussed in the "Applications" subsection of this report.

LANGUAGES: Digital offers the following major programming languages for the PDP-11 computers:

- *Basic-Plus-2*, for RSX-11M and RSX-11M-Plus, RSTS/E, Micro/RSX, and Micro/RSTS
- *Basic-Plus/RT-11*, for the RT-11 operating environment
- *Cobol-81*, for RSTS/E, RSX environments, Micro/RSX, and Micro/RSTS
- *DIBOL*, for CTS-300, Micro/RSTS, RSX-11M-Plus, and Micro/RSX
- *Fortran IV*, for RT-11, RSTS/E, and RSX environments
- *Fortran-77*, for RSX environments, RSTS/E, Micro/RSX, Micro/RSTS, and RT-11
- *PDP-11 Pascal*, for RSX-11M-Plus, RSX-11M, and Micro/RSX

The *PDP-11 Symbolic Debugger* is available for Fortran-77, Cobol-81, and the Macro-11 assembler in the following environments (where the specific languages are applicable): RSX-11M and -11M-Plus, RSTS/E, Micro/RSX, and Micro/RSTS.

COMMUNICATIONS: Digital offers a number of software products both for communications among Digital machines and for access to networks that include other vendors' systems.

Communications with other Digital computer systems and networks are handled through DECnet, a family of Phase IV network products that allows a suitably configured PDP-11 computer system to participate as a routing or nonrouting (end) mode in a network with other Digital systems. For an overview of DECnet, please see the DECnet-VAX description in the Communications section of the "DEC VAX Systems" report in this section of *Datapro Reports on Minicomputers*.

DECnet-RSX allows a suitably configured PDP-11 system to participate as a node in a DECnet network.

DECnet/E software allows a suitably configured RSTS/E system to participate as a routing or nonrouting node in DECnet computer networks.

DECnet-RT allows a suitably configured RT-11 foreground/background (FB) system to participate as an end node in DECnet Phase III (non-Ethernet) computer networks.

DEC PDP-11 Family

RSX-11 Packetnet Switching Interface (PSI) software is available in two forms: RSX-11 PSI/M and RSX-11 PSI/M-Plus. These products allow suitably configured RSX-11M- and RSX-11M-Plus-based systems, respectively, to connect to Packet Switching Data Networks (PSDNs) conforming to the CCITT recommendation X.25 (June 1980). These PSI products support task-to-task communications via the network and remote terminal communications through a packet assembler/disassembler (PAD) facility provided by the network.

The *RSX-11* and *Micro/RSX 2780/3780 Protocol Emulators* are Bisync RJE emulators that allow files or jobs to be transferred between PDP-11 systems and IBM hosts supporting either the IBM 2780 or 3780 protocol. Multiple lines and multiple users are supported concurrently through operator and program control.

The *RSX-11* and *Micro/RSX 3271 Protocol Emulators* provide facilities for both program-to-program interactive communications and data pass-through 3270 terminal emulation. Terminal users and application programs can exchange data with a program running under IMS/VS, CICS/VS, or TSO on an IBM 370 host.

UTILITIES: *Sort/Merge* reorders and combines data infiles. It comprises the Sort and Merge utility programs, a Sort/Merge callable subroutine package, and a detailed set of documentation. Sort/Merge can accept as input up to 10 RMS-11 formatted files and output 1 reordered RMS-11 formatted file. Records can be sequenced in ascending or descending order by as many as 16 key fields with a maximum key size of 512 bytes. The Sort/Merge product also contains a DCL interface and online help facilities for using the interface.

OFFICE AUTOMATION: PDP-11 systems are targeted toward general commercial applications, rather than toward office automation. However, the PDP-11 does have word processing and electronic mail packages for use in office environments.

DECtype is a full-featured word processing package for the CTS-300, RSX-11M-Plus, and Micro/RSX operating systems. It permits concurrent word and data processing in a multiuser environment.

DECdx is a layered software product that resides on an RSTS or RSX system, enabling DECmate/WPS systems—both standalone and shared resource—to be linked to the host for team computing functions, such as document exchange and data sharing. Documents can be transferred between the DECmate/WPS system and the host through a serial line interface.

WPS-Plus/RSX is a document processing application that provides Gold key-style word processing. It runs as a layered product under the RSX-11M-Plus and Micro/RSX operating systems and features menu-driven document processing, including word and list processing with math and sort capabilities.

DECmail-11 is a menu-mode or command-driven electronic mail system available for the RSTS/E, Micro/RSTS, RSX-11M-Plus, and Micro/RSX environments. Among other functions, users can create, edit, store, and forward messages. This system can also be used under DECnet for multinode access.

APPLICATIONS: Digital offers several data management, program development, and graphics applications for PDP-11 systems. In addition, over 2,000 third-party applications are available for the systems.

FMS-11 (Forms Management System) is used by applications programmers to build interactive screen-oriented data entry capabilities into application programs.

Datatrieve-11 is an interactive query, report, and data maintenance system that allows data retrieval, sorting, and updating; report generation and creation; and maintenance and accessing of data dictionary entries. Datatrieve-11 uses RMS-11 record management services. It is available for RSX-11M-Plus, RSX-11M, RSTS/E, Micro/RSX, and Micro/RSTS environments.

Menu-11 is a software package that allows application programmers to design a customized interface between a RSTS/E or Micro/RSTS system and its users.

RTEM-11 provides an RT-11 program development environment on Micro/RSX, RSX-11M, and RSX-11M-Plus. It allows several users to develop RT-11 applications concurrently on a host system. The programs can be created, edited, assembled, and linked on RTEM-11 and then debugged and executed on the RT-11 system.

PLXY-11 is a software package that provides RT-11, RSX-11M, RSX-11M-Plus, and RSTS/E application programmers with access to the plotting capabilities of Digital's LXY12 line printer.

A-to-Z software is a group of general-purpose application and office packages for MicroPDP-11 systems. The A-to-Z Base System includes the Micro/RSX operating system software; it provides menu and system management functions and allows users to install and modify Micro/RSX applications. Word Processing, Electronic Mail, Document Transfer, and Business Graphics modules are also available, as are a Data Inquiry module, for hard copy reports and terminal-based inquiries, and a Developer's Kit, which allows the creation or migration of software packages targeted for the A-to-Z Base System.

PRICING

POLICY: Digital provides PDP-11 systems on a purchase basis, with separately priced maintenance agreements. Discounts for volume purchases are available. Leasing arrangements are available through Digital's U.S. Customer Finance Group, which provides leasing alternatives through various programs for commercial organizations, state and municipal entities, and federal government agencies and prime contractors. Digital software is licensed rather than sold. Users purchase licenses and distribution rights separately.

SUPPORT: Each PDP-11 system includes a one-year onsite hardware warranty. Software products have a 90-day limited warranty. Digital offers a wide variety of hardware and software services for the PDP-11s and other systems. For detailed information, refer to the "DEC VAX Systems" report in *Datapro Reports on Minicomputers.*

TRAINING: For details on the types of training available from Digital Equipment, refer to the "DEC VAX Systems" report in *Datapro Reports on Minicomputers.*

DEC PDP-11 Family

EQUIPMENT PRICES

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
MicroPDP-11/53 SYSTEMS				
DH-153Q1-AA	MicroPDP-11/53 floor/table system; includes CPU, 512K-byte on-board memory, 20M-byte RD31 disk, RQDX3 disk controller, 1.2M-byte RX33 diskette, BA23 enclosure, documentation and diagnostics; 120 V system	9,020	85	101
DH-153Q1-A3	Same as DH-153Q1-AA, but 240 V system without documentation or diagnostics	8,720	85	101
DH-153Q5-AA	Same as DH-153Q1-AA, but substitutes 42M-byte RD32 disk	10,080	95	113
DH-153Q5-A3	Same as DH-153Q5-AA, but 240 V system without documentation or diagnostics	9,780	95	113
DJ-153Z1-AA	A-to-Z Business System; includes MicroPDP-11/53 CPU; 2.5M bytes of memory, 42M-byte RD32 disk; 1.2M-byte RX33 diskette; DZQ11 multiplexer with 4 serial lines; licenses for A-to-Z Base System, Word Processing, Electronic Mail, and SuperComp Twenty; documentation; and diagnostics	16,367	142	169
DJ-153Z2-AA	Same as DJ-153Z1-AA, but with two RD32 disks	18,467	162	193
MicroPDP-11/53 Plus SYSTEMS				
DH-153Q3-BA	MicroPDP-11/53 Plus floor/table system; includes 1.5M bytes of on-board memory, 71M-byte RD53 disk drive, RQDX3 disk controller, TK50 95M-byte tape drive and controller, DHQ11 8-line serial interface, BA23 enclosure, documentation, and diagnostics; 120 V system	17,800	150	179
DH-153Q3-B3	Same as DH-153Q3-BA, but 240 V system without documentation or diagnostics	17,500	150	179
DH-153Q7-BA	Same as DH-153Q3-BA, but substitutes 42M-byte RD32 disk drive and excludes DHQ11 8-line interface	14,900	117	139
DH-153Q7-B3	Same as DH-153Q7-BA, but 240 V system without documentation or diagnostics	14,600	117	139
MicroPDP-11/73 SYSTEMS				
DH-173Q1-CA	MicroPDP-11/73 floor/table system; includes CPU, 1M-byte parity MOS memory, 71M-byte RD53 disk drive, RQDX3 disk controller, 95M-byte TK50 tape drive and controller, DHQ11 8-line multiplexer, BA23 enclosure, 120 V power cord, documentation, and diagnostics	18,990	179	213
DH-173Q1-C3	Same as DH-173Q1-CA, but 240 V system without power cord, documentation, or diagnostics	18,680	179	213
173QY-C2	MicroPDP-11/73 BA23 System Building Block (SBB); includes CPU, 1M-byte memory, asynchronous console serial line, serial line cable, BA23 floor/tabletop enclosure, and 120 V power cord	11,141	NC	NC
173QY-C3	Same as 173QY-C2, but 240 V system without power cord	11,141	NC	NC
173QY-D2	MicroPDP-11/73 BA23 SBB; includes 2M-byte memory, asynchronous console serial line, serial line cable, BA23 floor/tabletop enclosure, and 120 V power cord	11,519	87	104
173QY-D3	Same as 173QY-D2, but 240 V system without power cord	11,519	87	104
173QB-C2	MicroPDP-11/73 BA123 SBB; includes CPU, 1M-byte memory, BA123 floorstanding enclosure, and 120 V power cord	14,564	90	107
173QB-C3	Same as 173QB-C2, but 240 V system without power cord	14,564	90	107
173QB-D2	Same as 173QB-C2, but with 2M-byte memory	15,057	97	115
173QB-D3	Same as 173QB-C3, but with 2M-byte memory	15,057	97	115
MicroPDP-11/83 SYSTEMS				
DH-183Q1-BA	MicroPDP-11/83 BA23 floor/table system; includes CPU with floating-point accelerator (FPA), 2M-byte memory, 159M-byte RD54 disk drive, RQDX3 disk controller, 95M-byte TK50 tape drive and controller, DHQ11 8-line multiplexer, BA23 enclosure, 120 V power cord, documentation, and diagnostics	25,000	207	246
DH-183Q1-B3	Same as DH-183Q1-BA, except 240 V system without power cord, documentation, or diagnostics	24,700	207	246
DH-183Q5-AA	MicroPDP-11/83 BA213 floorstanding system; includes CPU with FPA, 2M-byte memory, 159M-byte RD54 disk drive, RQDX3 disk controller, 95M-byte TK50 tape drive and controller, BA213 floorstanding enclosure, 120 V power cord, documentation, and diagnostics	31,600	222	264
DH-183Q5-A3	Same as DH-183Q5-AA, but 240 V system without power cord, documentation, or diagnostics	31,300	222	264

**Upgrade kits to convert older, UNIBUS-based PDP-11s—the -11/04, -11/24, -11/34, -11/44, and -11/70—to the PDP-11/84.*
NC—No charge.
NA—Not applicable.

DEC PDP-11 Family

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
DH-183Q2-CA	MicroPDP-11/83 BA123 floorstanding system; includes CPU with FPA, 2M-byte memory, 159M-byte RD54 disk drive, RQDX3 disk controller, 95M-byte TK50 tape drive and controller, two DHQ11 8-line multiplexers, BA123 enclosure, 120 V power cord, documentation, and diagnostics	31,600	232	276
DH-183Q2-C3	Same as DH-183Q2-CA, but 240 V system without power cord, documentation, or diagnostics	31,300	232	276
DH-183Q3-BA	MicroPDP-11/83 H9642 cabinet system; includes CPU with FPA, 2M-byte memory, 456M-byte RA81 disk drive, KDA50 disk controller, 95M-byte TK50 tape drive and controller, two DHQ11 8-line multiplexers, H9642 cabinet with dual BA23 boxes, 120 V power cord, documentation, and diagnostics	50,100	304	362
DH-183Q3-B3	Same as DH-183Q3-BA, but 240 V system without power cord, documentation, or diagnostics	49,800	304	362
183QY-D2	MicroPDP-11/83 BA23 System Building Block (SBB); includes CPU, 2M-byte memory, asynchronous console serial line, serial line cable, BA23 floor/ tabletop enclosure, and 120 V power cord	13,500	83	99
183QY-D3	Same as 183QY-D2, but 240 V system without power cord	13,500	83	99
183QB-D2	MicroPDP-11/83 BA123 SBB; includes CPU with FPA, 2M-byte memory, BA123 floorstanding enclosure, and 120 V power cord	17,040	93	111
183QB-D3	Same as 183QB-D2, but 240 V system without power cord	17,040	93	111
183QE-D2	MicroPDP-11/83 H9642 cabinet SBB; includes CPU with FPA, 2M-byte memory, asynchronous console serial line, serial line cable, H9642 cabinet with dual BA23 boxes, and 120 V power cord	22,200	99	118
183QE-D3	Same as 183QE-D2, but 240 V system without power cord	22,200	99	118
PDP-11/84 SYSTEMS				
SX-JX200-EC/ED	PDP-11/84 H9642 System Building Block (SBB); includes CPU, 2M-byte memory, H9642 cabinet, and choice of RSTS/E, RSX-11M or -11M-Plus, or DSM-11 operating system license	25,200	136	162
SX-JX200-EE/EF	Same as SX-JX200-EC/ED, but with 4M-byte memory	27,200	168	200
SX-JX300-EC/ED	PDP-11/84 H9645 wide-body SBB; includes CPU, 2M-byte memory, H9645 cabinet, and choice of RSTS/E, RSX-11M or 11M-Plus, or DSM-11 operating system license	25,500	136	162
SX-JX300-EE/EF	Same as SX-JX300-EC/ED, but with 4M-byte memory	27,500	168	200
SX-JX400-EC/ED	PDP-11/84 H9647 four-high SBB; includes CPU, 2M-byte memory, H9647 cabinet, and choice of RSTS/E, RSX-11M or -11M-Plus, or DSM-11 operating system license	26,500	136	162
SX-JX400-EE/EF	Same as SX-JX400-EC/ED, but with 4M-byte memory	28,500	168	200
MicroPDP-11 UPGRADES				
11/73-UA	MicroPDP-11/23 to -11/73 upgrade kit; includes MicroPDP-11/73 CPU board and cabinet kit, diagnostics on RX50 diskette, documentation, and Field Service installation	7,634	NC	NC
11/73-UB	MicroPDP-11/23 Plus to -11/73 upgrade kit; includes same components as 11/73-UA	7,634	NC	NC
11/73-UC	MicroPDP-11/03 or -11/23-A to -11/73 upgrade kit; includes MicroPDP-11/73 CPU board, 512K bytes of memory, BA23 enclosure, RLV12 disk controller, diagnostics on RL02 disk, documentation, and Field Service installation	16,086	NC	NC
11/83-UA	MicroPDP-11/73 to -11/83 upgrade kit; includes MicroPDP-11/83 CPU board, 2M bytes of memory, diagnostics on RX50 diskette, documentation, and Field Service installation	10,710	71	85
11/83-UB	MicroPDP-11/23 to -11/83 upgrade kit; same components as 11/83-UA	11,865	71	85
11/83-UC	MicroPDP-11/23 Plus to -11/83 upgrade kit; same components as 11/83-UA, but with diagnostics on RL02 disk	12,338	71	85
630XR-CA	MicroPDP-11 to MicroVAX II upgrade kit; includes VMS license and 95M-byte TK50 tape drive; 120 V system	23,520	171	204
630XR-CB	Same as 630XR-CA, but 240 V system	23,520	171	204
630XR-CC	MicroPDP-11 to MicroVAX II upgrade kit; includes VMS license only; 120 V/240 V system	18,690	141	168
630XR-DA	MicroPDP-11 to MicroVAX II upgrade kit; includes ULTRIX license and 95M-byte TK50 tape drive; 120 V system	21,315	171	204
630XR-DB	Same as 630XR-DA, but 240 V system	21,315	171	204
630XR-DC	MicroPDP-11 to MicroVAX II upgrade kit; includes ULTRIX license only; 120 V/240 V system	16,485	141	168
11E23-UA	4-to-8 slot system backplane upgrade; includes Field Service installation	3,465	NA	NA

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NC—No charge.
NA—Not applicable.

DEC PDP-11 Family

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
PDP-11/84 UPGRADES				
11/84-U2	11/84-P to -A series module set upgrade; includes PDP-11/84 CPU and 2M bytes of memory	11,954	71	85
11/84-UH/UJ	*UNIBUS PDP-11 to -11/84 box-level upgrade; includes 5.25-inch rack-mount enclosure with CPU and 2M bytes of memory, documentation, diagnostics, and service; 120 V/240 V system	18,200	121	144
11/84-UK/UL	*UNIBUS PDP-11 to -11/84 box-level upgrade; includes 10.5-inch rack-mount enclosure with CPU and 2M bytes of memory, documentation, diagnostics, and service; 120 V/240 V system	22,300	136	162

**Upgrade kits to convert older, UNIBUS-based PDP-11s—the -11/04, -11/24, -11/34, -11/44, and -11/70—to the PDP-11/84.*
NC—No charge.
NA—Not applicable. ■