DEC PDP-11 Family

MANAGEMENT SUMMARY

UPDATE: *Since our last update, Digital Equipment has introduced the MicroPDP-11/53, the MicroPDP-11/83, and the PDP-11/84. These introductions have significantly altered the PDP-11 family. The MicroPDP-11/53 is now the entry-level model. The MicroPDP-11/83 is the largest of the MicroPDP systems, and the PDP-11/84 tops out the PDP-11 family. Digital is no longer actively marketing the MicroPDP-11/23, the PDP-11/23-Plus, the PDP-11/24, and the PDP-11/44.*

According to Digital, the new MicroPDP-11/53 offers twice the performance of the MicroPDP-11/23 it replaces and approximately 50 to 70 percent that of the MicroPDP-11/73. The MicroPDP-11/53 is based on a 15MHz version of Digital's J-11 microchip. Like the other systems in the MicroPDP-11 line, it is based on the Q-Bus architecture, but unlike any other, it has a single-board processor that includes 0.5MB of memory right on the board. The system can be expanded to as much as 41.2MB of built-in disk storage. The MicroPDP-11/53 supports up to 8 simultaneous users—twice as many as the MicroPDP-11/23, formerly the entry-level model in the line. The new system is being offered for approximately the same price as the older model. ▷
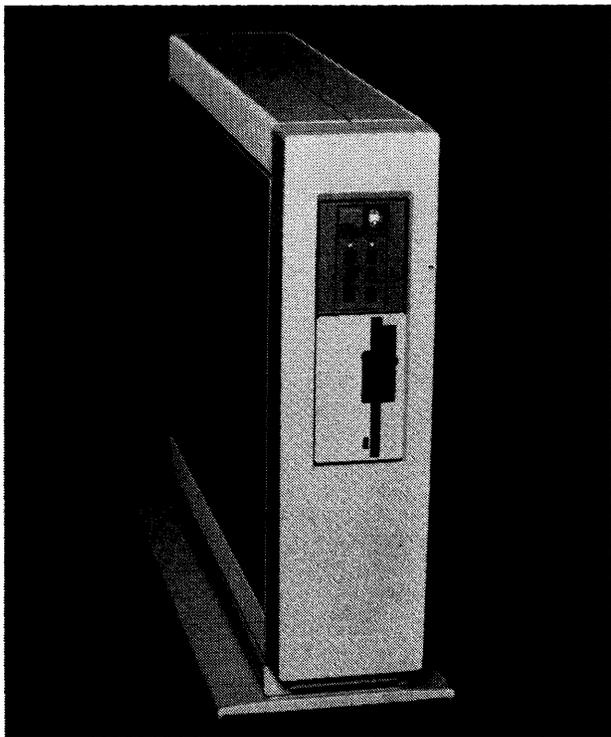
The MicroPDP-11/53 replaces the MicroPDP-11/23 as the entry-level member of the PDP-11 family, providing twice the performance at about the same price. The system sports a 15MHz processor and employs Digital's Q-Bus I/O architecture, the same as that employed in the company's MicroVAX II.

Digital Equipment Corporation continues to enhance its PDP-11 family, recently adding models to both the low and high ends of the family. New storage media and configuration options have added additional dimensions to this longtime competitor in the commercial computing market, both strengthening the family itself and increasing compatibility with Digital's more powerful VAX systems.

MODELS: MicroPDP-11/53; MicroPDP-11/73; MicroPDP-11/83; and PDP-11/84.
MEMORY: 512KB to 4MB.
DISK CAPACITY: 1.6MB to 3.6GB.
WORKSTATIONS: Up to 48. (Concurrent users; number can vary according to application.)
PRICE: $9,270 to $64,000 (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.

DATA FORMATS

BASIC UNIT: 16-bit word plus two parity bits. The processor can also handle 8-bit bytes, and is capable of bit manipulation.

FIXED-POINT OPERANDS: 6-bit words or 8-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 available for 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 cod operators group. Operation codes vary from 4 bits to 16 ' in length.

INTERNAL CODE: ASCII for text-oriented d⁻ for calculations.

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CHART A. SYSTEM COMPARISON

MODEL	MicroPDP-11/53	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	RT-11; MicroPower/ Pascal; Micro/RSX; Micro/RSTS; Ul-trix-11; DSM11; CTS-300	RT-11; RSX-11S; RSX-11M; Mi-cro/RSX; RSX-11M-Plus; RSTS/E; Micro/RSTS; Ul-trix-11; CTS-300	RT-11; RSX-11S; RSX-11M; RSX-11M-Plus; RSTS/E; Micro/ RSX; Micro/RSTS; Ul-trix-11; DSM-11; CTS-300	RT-11; RSX-11S; RSX-11M; RSX-11M-Plus; RSTS/E; Ultrix-11; DSM-11; CTS-300
Upgradable from	Not applicable	Not applicable	Not applicable	Not applicable
Upgradable to	Not applicable	Not applicable	Not applicable	Not applicable
MIPS	—	—	—	—
Relative performance (based on a rating of the 11/70 at 1.0)	0.5	0.7	1.2	1.2
MEMORY				
Minimum capacity, bytes	512K	512K	2M	1M
Maximum capacity, bytes	4M	4M	4M	4M
Type	MOS	MOS	ECC MOS	ECC MOS
Cache memory	None	8KB	8KB	8KB
Cycle time, nanoseconds	—	560	—	—
Bytes fetched per cycle	2	2	2	2
INPUT/OUTPUT CONTROL				
Number of channels	—	—	—	—
High-speed buses	None	None	None	None
Low-speed buses	1	1	1	1
MINIMUM DISK STORAGE	20MB	11MB	11MB	10.4MB
MAXIMUM DISK STORAGE	208MB	208MB	208MB	3.6GB
NUMBER OF WORKSTATIONS	8 active	12 active	30+ active	48 active
COMMUNICATIONS PROTOCOLS	2780/3780, 3270, Hasp, SNA, DNA, DDCMP, X.25, 200UT, Univac 1004	2780/3780, 3270, Hasp, SNA, DNA, DDCMP, X.25, 200UT, Univac 1004	2780/3780, 3270, Hasp, SNA, DNA, DDCMP, X.25, 200UT, Univac 1004	2780/3780, 3270, Hasp, SNA, DNA, DDCMP, X.25, 200UT, Univac 1004

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

The MicroPDP-11/53 can run the following Digital operating systems: CTS-300, DSM-11, MicroPower/Pascal, Micro/RSX, RT-11, Micro/RSTS, and Ultrix-11 (Digital's 16-bit implementation of AT&T's Unix operating system). According to Digital, the new system is fully software compatible with the entire PDP-11 line.

The MicroPDP-11/53 supports Q-Bus peripherals, and, in addition, uses Digital's new half-height 5¼-inch mass storage devices. The RD31 is a hard disk that offers 20MB of storage. Two RD31s can be configured, for a maximum internal hard disk capacity of 40MB. The RX33 is a diskette drive that provides up to 1.2MB of storage capacity. It is the first of Digital's diskettes to accept both the RX50 format from Digital and the IBM PC AT format. That compatibility allows users to exchange files between PDP-11 systems and desktop computers manufactured by other companies.

The MicroPDP-11/53, available in both rackmount and pedestal versions, is targeted at markets that include real-time process control, small businesses, scientific, communications, and government offices.

The MicroPDP-11/83 CPU uses a faster, 18MHz version of the J-11 chip set. It includes a floating-point accelerator ▷

MAIN STORAGE

TYPE: Storage types include Parity MOS (MicroPDP-11/53 and MicroPDP-11/73), ECC MOS (MicroPDP-11/53, -11/73 and -11/83 and PDP-11/84), and MOS (MicroPDP-11/73).

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

CAPACITY: Main memory ranges from 512KB to 4MB. See Chart A for memory capacities of specific models. Increment sizes are as follows: 1MB and 2MB on MicroPDP-11/83 and PDP-11/84; 512KB, 1MB, and 2MB on MicroPDP-11/53; and 256KB, 512KB, 1MB, 2MB, and 4MB on MicroPDP-11/73.

CHECKING: Parity on the basis of one bit per byte is available with dynamic MOS memory for the MicroPDP-11/53 and the MicroPDP-11/73. Error correcting and checking (ECC) is a feature 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 and most multiple-bit errors.

STORAGE PROTECTION: Via the memory management function on all PDP-11s. Mapping automatically provides hardware storage protection.

RESERVED STORAGE: The uppermost 8192 bytes on the Unibus-based 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. Floating vectors are assigned for communications and other devices that interface with the PDP-11. ▶

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chip and a private memory interconnect (PMI) for enhanced performance. According to Digital, a new error checking and correcting (ECC) MOS memory further enhances the system's reliability. The MicroPDP-11/83 has 8KB of direct-mapped write-through cache memory.

The MicroPDP-11/83 is the first Q-Bus PDP-11 computer that can be used with Digital's high-capacity, high-performance disk storage perpherals. Both a 456MB nonremovable and a 205MB removable disk drive can be used.

The MicroPDP-11/83 is available in a floorstanding model and a cabinet model. Digital is targeting the MicroPDP-11/83 to technical and commercial markets, including offices, small businesses, manufacturing plants, laboratories, and other application environments requiring process control or data acquisition and analysis.

The PDP-11 family is divided into two groups along architectural lines. The MicroPDP-11/53, -11/73, and -11/83 systems are based on Digital's Q-Bus, while the PDP-11/84 is based on the Unibus. The two buses are similar in I/O speed and memory addressability, but differ as to the range of communications interfaces and the size and variety of peripherals they can support.

The PDP-11/84, Digital's new top-of-the-line offering of the PDP-11 family, uses a 15MHz version of the J-11 chip set and contains arithmetic and control logic. The system has a full PDP-11 instruction set, including Extended Instruction Set (EIS), floating-point instructions, 8KB of direct-mapped write-through cache memory, and a Memory Management Unit (MMU). Although the Unibus is used to attach external devices, a Private Memory Interconnect is used for transactions with memory and for the cache memory system.

The PDP-11/84 is available in rackmount and cabinet configurations. According to Digital, it is the same as the MicroPDP-11/83 in terms of performance, differing only in that it uses Unibus architecture instead of Q-Bus. Digital targets the PDP-11/84 to markets that include offices, small businesses, factory and laboratory automation, and engineering.

The MicroPDP-11/73 remains a significant member of the MicroPDP-11 line. The MicroPDP-11/73 CPU also incorporates a 15MHz version of Digital's J-11 microprocessor chip set, providing floating-point instructions, 8KB of direct-mapped write-through cache memory, and an MMU. The system supports from 512KB to 4MB of main memory.

Recent enhancements for the MicroPDP-11/73 include new higher density memory boards and the ability to use ▷

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

CENTRAL PROCESSOR

GENERAL: The MicroPDP-11 systems are all based on Digital's Q-Bus. The CPU used in the MicroPDP-11/53 and the MicroPDP-11/73 is a multifunction module. It includes the 15MHz CMOS VLSI J-11 microprocessor chip set (instruction set processor and memory management unit), an asynchronous serial line (two lines for the -11/53), line frequency clock, a 32KB bootstrap/diagnostic ROM, a 2KB electrically erasable ROM, and a serial line unit for the console terminal. The MicroPDP-11/73 includes an 8KB 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, a 32KB bootstrap/diagnostic ROM, a 2KB electrically erasable ROM, and a serial line unit for the console terminal. The MicroPDP-11/83 also includes a floating-point accelerator chip (FPJ11) and a private memory interconnect (PMI) for enhanced performance, as well as an 8KB direct-mapped, write-through cache memory.

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 is based on the Digital Unibus. The CPU of the PDP-11/84 is a microprogrammed processor that executes arithmetic and control logic operations to produce fixed-point arithmetic, hardware multiply and divide, and extensive test and branch instructions. Additional microcode, available as an option, allows the execution of single- and double-precision (32- and 64-bit) floating-point instructions.

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.

CONTROL STORAGE: Information unavailable from vendor.

REGISTERS: The MicroPDP-11/53 and the MicroPDP-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 (self-incrementing/decrementing register which points to an address in memory); Indexed; and Indexed Indirect. The eight modes can allow a specific opera- ▶

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CHART B. MASS STORAGE

MODEL	RD31	RD52	RD53	RL02	RC25
Type	Winchester	Winchester	Winchester	Cartridge	Fixed/removable
Controller model	—	RQDX3	RQDX3	RLV12 (Q-Bus) or Integrated (Unibus)	Integrated (Q-Bus or Unibus)
Drives per subsystem/controller	2	2	2	4	2
Formatted capacity per drive, megabytes	20	31	71	10.4	26/26
Number of usable surfaces	—	—	—	2	4
Number of sectors or tracks per surface	—	3,485 tracks	1,200 tracks	512 tracks	831 tracks
Bytes per sector or track	—	512/sector	512/sector	256/sector	512/sector
Average seek time	—	49 ms	30.5 ms	55 ms	35 ms
Average rotational/relay time	—	8.5 ms	8.3 ms	12.5 ms	10.5 ms
Average access time	—	57.5 ms	38.8 ms	67.5 ms	45.5 ms
Data transfer rate	—	625KB/sec.	625KB/sec.	512KB/sec.	1.23MB/sec.
Supported by system models	MicroPDP-11/53	MicroPDP-11/53, -11/73 and -11/83	MicroPDP-11/53, -11/73, and -11/83	All	All
Comments					Combines 26MB Winchester and 26MB sealed removable cartridge

CHART B. MASS STORAGE (Continued)

MODEL	RA60	RA80	RA81	RX33	RX50
Type	Removable	Winchester	Winchester	Diskette	Diskette
Controller model	KDA50 or UDA50	KDA50 or UDA50	KDA50 or UDA50	—	RUX50 or RQDXE
Drives per subsystem/controller	4	4	4	2	2
Formatted capacity per drive, megabytes	205	121	456	1.2	0.818
Number of usable surfaces	6	7	7	—	1
Number of sectors or tracks per surface	1,600 tracks	1,092 tracks	2,496 tracks	—	80 tracks
Bytes per sector or track	512/sector	512/sector	512/sector	—	512/sector
Average seek time	41.7 ms	25 ms	28 ms	—	164 ms
Average rotational/relay time	8.3 ms	8.3 ms	8.3 ms	—	100 ms
Average access time	50 ms	33.3 ms	36.3 ms	—	264 ms
Data transfer rate	1.98MB/sec.	1.2MB/sec.	2.2MB/sec.	—	250KB/sec.
Supported by system models	MicroPDP-11/83, PDP-11/84	MicroPDP-11/83, PDP-11/84	MicroPDP-11/83, PDP-11/84	MicroPDP-11/53	All
Comments					

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

the 71MB storage disk and the 95MB streaming tape subsystems available for the MicroPDP-11/83 and the MicroVAX II. The MicroPDP-11/73 is available in rackmount, floorstanding, and desktop enclosures.

Ten principal operating sytems are available for PDP-11 systems. RT-11 is a single-user, realtime operating system for interactive program development and dedicated online applications. RSX-11M is a compact, realtime system for multiprogramming applications and program development. RSX-11M-Plus is an optimized version of RSX-11M for larger multipurpose realtime applications and program development. RSX-11S is an execute-only realtime system for multiprogramming applications; it requires an RSX-11M, RSX-11M-Plus, or VAX/VMS system for generation and program development. Micro/RSX is an extended version of RSX-11M-Plus for the MicroPDP-11 systems only; it is intended for small commercial and realtime applications, as well as for small multiuser program development in both high-level languages and Macro assembly.

RSTS/E is a general timesharing, resource-sharing system that permits simultaneous occurrence of different types of

tion code to accomplish register/register, register/memory, memory/memory, memory/stack, and register/stack manipulation.

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

OPERATING ENVIRONMENT: The MicroPDP-11/53, the MicroPDP-11/73, and the MicroPDP-11/83 come in rackmount, floorstanding, and tabletop enclosures. The rackmount enclosure is 5.2 inches high, 19 inches wide, and 25.5 inches deep; the floorstanding model is 24.5 inches high, 10 inches wide, and 28.5 inches deep; the tabletop model is 6 inches high, 21.5 inches wide, and 27 inches deep. The tabletop and floorstanding models each weigh 70 pounds; the rackmount model weighs 55 pounds. Power requirements are 120 VAC, 60 Hz, 90 to 128 VRMS or 240 VAC, 50 Hz, 180 to 256 VRMS. For systems with RX50 diskettes, permissible operating temperature range is 59 degrees Fahrenheit to 90 degrees Fahrenheit at 20 percent to 80 percent humidity; operating temperatures for systems with RD51/RD52 disks range from 50 degrees Fahrenheit to 104 degrees Fahrenheit.

The PDP-11/84 is available in cabinet-mounted or rackmount versions. The cabinet-mounted version is 41.6 inches high, 21.3 inches wide, and 32 inches deep; it weighs 331 pounds. Power requirements are 120 VAC, 60 Hz, 90 to 132 VRMS or 240 VAC, 50 Hz, 180 to 264 VRMS. Operating temperature is 50 degrees Fahrenheit to 104 degrees Fahrenheit at 10 percent to 90 percent humidity. The rackmount CPU box is 10.4 inches high, 19 inches wide, and 27 inches

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activities, including batch processing, interactive data processing, and detached job processing. Micro/RSTS, designed for the MicroPDP-11 computers, is a prebuilt subset of RSTS/E that runs on all PDP-11 computers. It supports system calls and programming facilities supported by RSTS/E. DSM-11 is a multiuser data management system with timesharing facilities for interactive users, detached jobs, and other simultaneous activities. Ultrix-11 is an interactive, timesharing, native Unix operating system based on the AT&T Version 7 Unix; it also features Berkeley and AT&T Unix System V enhancements. Ultrix-11 is compatible with Ultrix-32 and Ultrix-32m, the Berkeley-Unix-based systems for the VAX family. CTS-300 is a disk-based, single-user or multiuser operating system for commercial applications on smaller PDP-11 systems.

Local area and wide area communications among Digital systems are handled through DECnet software, which permits networks of over 1,000 nodes and can provide both Ethernet and X.25 communications facilities. Communications with IBM and other industry-standard systems and networks are handled through Digital's Internet software products.

Digital also offers office automation, data management, and program development applications for the PDP-11 family. In addition to Digital-proprietary business applications, over 2,000 third-party software packages are available for the PDP-11 family.

COMPETITIVE POSITION

In Robert Graves' novel *I, Claudius*, the title character's mother, remarking on the future emperor's uncanny ability to weather the political intrigues of imperial Rome, says, "I believe you'd survive a universal flood." The same thing might well be said of Digital Equipment's PDP-11 systems. The product line has been around for over 15 years, yet it continues to evolve and grow.

The growth potential for this family of 16-bit systems is limited, of course, because Digital has shifted it marketing emphasis to the larger, far more powerful 32-bit VAX family. Still, by emphasizing development of the MicroPDP-11 grouping within the product family, Digital has largely converted the PDP-11 series from a group of conventional minicomputers to a line of office-installable supermicros suitable for a range of commercial and technical and technical applications, from general accounting to laboratory data collection and analysis. Moreover, the PDP-11/84 remains as a standard minicomputer for larger storage applications and traditional computer room functions.

The PDP-11 family competes against a range of general-purpose supermicros and minicomputers, including IBM's System 36, Hewlett-Packard's HP 260 and HP 3000 Series, Honeywell's DPS6 line, and Data General's Desktop Generation.

deep; it weighs 98 pounds. Electrical requirements are 120 VAC, 60 Hz, 90 to 132 VRMS or 240 VAC, 50 Hz, 180 to 264 VRMS. Operating temperature range is 50 degrees Fahrenheit to 122 degrees Fahrenheit at 10 percent to 95 percent humidity.

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 or modules of a PDP-11 family system as equal-level devices for data access and transfers; those components include the processor, memory modules, and peripheral controllers. 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. Both buses are similar, but Unibus allows greater flexibility and variety in the type and number of peripherals that can be attached.

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 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 mass storage (system and load) device menu and console terminal menus. Selections from communications device and software license menus are optional. Standard Systems, based on SBBs, include the hardware (disk, tape, and communications) and software components necessary for a functioning system; only a console must be selected.

The MicroPDP-11 systems are available in various enclosures. The MicroPDP-11/53 employs the 8-slot BA23 box in both rackmount and floorstanding/pedestal versions. The MicroPDP-11/73 is available in similar BA23 packaging, as well as in the larger BA123 floorstanding enclosure. The MicroPDP-11/83 comes in either a BA123 floorstanding model or a larger H9642 cabinet, which includes two BA23 enclosures.

The BA23 enclosure can internally accommodate one RD52 or RD53 fixed disk and one RX50 diskette or TK50 tape drive. The BA23 configuration can be expanded to include tabletop or rackmount versions of those devices. The BA123 package accommodates up to four 5.25-inch storage devices, including the RD52, RD53, RX50, and TK50. The two BA23 enclosures in the H9642 cabinet package can accommodate a total of four 5.25-inch storage devices, including the aforementioned disk and tape drives. The H9642 cabinet also provides space for two 10.5-inch storage devices, including the RA60 and RA81 disks and the TS05 tape.

The PDP-11/84 is available in rackmount and H9642 cabinet-based configurations.

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. Up to 127 terminals can be configured on RSTS/E-based systems. The number of concurrently operating terminals supported can vary, depending upon the application. The MicroPDP-11/53 supports up to 8 concurrently active users. The MicroPDP-11/73 accommodates up to 12 concurrently active workstations. The MicroPDP-11/83 supports over 30 simultaneously active stations, and the PDP-11/84 supports up to 48 concurrently active users.

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CHART C. WORKSTATIONS

MODEL	VT220	VT240	VT241
DISPLAY PARAMETERS			
Max. chars./screen	3168	3168	3168
Buffer capacity	—	—	—
Screen size (lines x chars.)	24 x 80 or 132	24 x 80 or 132	24 x 80 or 132
Tilt/swivel screen	Tilt standard	Standard	Standard
Symbol formation	7 x 10 dot-matrix	8 x 10 dot-matrix	8 x 10 dot-matrix
Character phosphor	White, green, or amber	White, green, or amber	White, green, or amber
Total colors/no. simult. displayed	Not applicable	Not applicable	4
KEYBOARD PARAMETERS			
Style	Typewriter	Typewriter	Typewriter
Character/code set	ASCII and line-drawing graphics	ASCII and line-drawing graphics	ASCII and line-drawing graphics
Detachable	Yes	Yes	Yes
Program function keys	15	15	15
TERMINAL INTERFACE	RS-232-C, RS-423, 20 ma std.	RS-232-C, RS-423, 20 ma std.	RS-232-C, RS-423, 20 ma std.
COMMENTS		800 x 240 pixel graphics array.	800 x 240 pixel graphics array.

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

ADVANTAGES AND RESTRICTIONS

The PDP-11 has several significant advantages. The variety of available configurations allows users to acquire and build systems that can address small-scale, large-scale, or mid-range application requirements. The range of operating systems gives users a choice among realtime, timesharing, and batch operations, as their requirements dictate. Moreover, because most of those operating systems are compatible across the system line, software can be directly transported from one model to another; programs developed on a MicroPDP-11 system can be transported without alteration to a PDP-11/84 running in the same operating environment.

The PDP-11 systems demonstrate a high degree of software and hardware compatibility with Digital's VAX systems; that is highly beneficial to users, for it provides a natural growth path between the 16-bit and 32-bit product lines. In designing the MicroPDP-11 computers, Digital has consciously implemented the same form factors used for the MicroVAX II in order to retain size and Q-Bus (and, now, Unibus) peripheral compatibility (the new MicroPDP-11/83 supports Unibus peripherals, as do the large configurations of the MicroVAX II). All along the line, peripherals from Q-Bus- and Unibus-based PDP-11 systems can be transferred to similar VAX systems, so users can reduce migration costs if they move up to a VAX. Digital's switch from the Unibus to the VAXBI bus for the newer VAX 8000 systems may have a future impact on peripheral connectivity, but as long as Unibus adapters are available for VAXBI-based systems, users of high-end PDP-11 systems can continue to port their peripherals to the VAX line.

PDP-11 applications can be run in compatibility mode on the VAX systems. That congruency between the two product lines is a plus for PDP-11 users who want to move upward; they need not recode their programs if they go to a larger system.

DISK STORAGE: Up to eight disk drives can be attached to RT-11-, RSX-11S-, RSX-11M-, and RSX-11M-Plus-based systems; up to 16 can be attached to RSTS/E-based systems. The MicroPDP-11 systems and the PDP-11/84 can support up to 208GB of disk storage.

MAGNETIC TAPE: The MicroPDP-11 systems support the TK50, a 95MB cartridge tape drive. The PDP-11/84 supports TU80 1600 bpi PE tape drives, TU81-Plus 1600/6250 bpi PE/GCR tape drives, and TS05 1600 bpi PE tape drives. The maximum number of magnetic tape subsystems that can be attached to any single system is eight.

PRINTERS: 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.

OTHER PERIPHERALS: PDP-11 systems support an ink-jet color printer, dot-matrix and letter-quality printers, and a voice synthesis module.

The LCP01 is a desktop ink jet color printer that produces presentation-quality graphics on paper and transparencies. It incorporates a graphics processor, and can store up to five fonts in local memory. The LCP01 can print up to 216 shades, and has a maximum resolution of 1,536 by 1,152 dots. It is compatible with Digital's VT240/241 graphics terminals.

The LA50 Personal Printer is a tabletop dot-matrix printer for use with video terminals and small systems. It prints at speeds up to 100 cps in text mode and 50 cps in memo mode; it also has a graphics capability. The LA12 DECwriter Correspondent is an interactive printing terminal that prints up to 80 cps in memo mode and 150 cps in draft mode. The LA100 is a microprocessor-controlled hard copy terminal and printer; it can print up to 240 cps in draft mode, 30 cps in letter-quality mode, and 80 cps in memo mode. The LA100 is available in two versions: the receive-only Letterprinter 100 and the keyboard send/receive Letterwriter 100. The LA120 is a 180-cps printing terminal. Like the LA100, the LA120 is available in two versions: the receive-only DECprinter III and the keyboard send/receive DECwriter III.

The LA210 is a dot-matrix printer that achieves speeds of 40 cps in letter-quality mode, 80 cps in correspondence mode, and 240 cps in draft mode. It has a graphics capabili-

DEC PDP-11 Family

CHART D. PRINTERS

MODEL	LXY12/22	LG01/LG02	LP25	LP26
Type	Dot-matrix	Matrix	Band	Band
Speed	300/600 lpm	600 lpm	300/215 lpm	600/445 lpm
Bidirectional printing	No	—	No	No
Paper size	—	4-16 in. wide; 3-20 in. long	Up to 15 inches	Up to 15 inches
Character formation	Variable	Dot-matrix	Full	Full
Horizontal character spacing (char./inch)	Variable	Variable	Variable	10
Vertical line spacing (char./inch)	—	—	6 or 8	6 or 8
Character set	96 or 192 ASCII	64 (DP mode)	64/96	64/96
Controller/Interface	LP11/RS-232-C, DMF32	DMF32/RS-232-C or parallel	LP11, DMF32	LP11, DMF32
No. of printers per controller/interface	—		—	—
Printer dimensions, in. (h x w x d)	46.5 x 30.0 x 24.3	38.0 x 33.5 x 22.3	43.8 x 30.3 x 33.6	43.8 x 30.3 x 33.6
Graphics capability	Yes	LG02 only	No	No
Comments		LG01 text printer upgradable to LG02 text/graphics printer		

CHART D. PRINTERS (Continued)

MODEL	LP27	LN01S	LN03	LN03 Plus
Type	Band	Laser	Laser	Laser
Speed	1200/800 lpm	12 ppm	8 ppm	8 ppm
Bidirectional printing	No	Not applicable	Not applicable	Not applicable
Paper size	Up to 18.75 inches	8.5 x 11 or 8.5 x 14 inches	8.5 x 11 inches	8.5 x 11 inches
Character formation	Full	300 x 300 dots/in.	300 x 300 dots/in.	300 x 300 dots/in.
Horizontal character spacing (char./inch)	10	Variable	Variable	Variable
Vertical line spacing (char./inch)	6 or 8	Variable	Variable	Variable
Character set	64/96	12 Courier-like fonts std.	ASCII; 16 resident Courier/Elite fonts	17 resident fonts, incl. ASCII, technical
Controller/Interface	Integrated, DMF32	LP11, DMF32	Integrated controller; RS-232-C interface	Integrated controller; RS-232-C interface
No. of printers per controller/interface	—	—	1	1
Printer dimensions, in. (h x w x d)	49 x 35 x 38	36.0 x 25.8 x 26.0	15.0 x 21.0 x 23.5	15.0 x 21.0 x 23.5
Graphics capability	No	Yes	No	Yes
Comments				Provides bit-mapped, Tektronix 4010/4014-compatible graphics

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

On the negative side, there is no direct upgrade path within the PDP-11 family; no system can be field upgraded to the next highest model. Thus, in-family migration to a more powerful computer requires a processor swap.

To reaccentuate the positive, however, it should be pointed out that, because of its popularity—it is estimated that well over 100,000 systems are installed worldwide—thousands of software packages and hundreds of peripheral devices are available from third-party vendors for the PDP-11 family. Due to continued vendor support and its entrenched user and third-party vendor bases, the PDP-11 line figures to be around for some time to come.

USER REACTION

Datapro's 1986 Computer Users Survey garnered ratings for 99 PDP-11 systems. The average installed time for each system was 55.8 months. (A number of the models rated are no longer actively marketed by Digital Equipment.) Purchased systems accounted for 80.8 percent of the responses;

ty. The LQP02 is a 32-cps letter-quality daisywheel printer. The LQP03 is a 130-petal daisywheel printer; it can print 25 cps in 10-inch Shannon text and 34 cps in 12-pitch triple-A text.

DECtalk is a voice synthesis module that converts standard ASCII text into speech output. DECtalk uses RS-232-C interconnection, standard operating system support, and standard terminal control sequences. It also features modular telephone connections which allow users to access a computer data base with a standard touch-tone telephone.

MASS STORAGE

See Chart B.

INPUT/OUTPUT UNITS

See Chart C for workstations, Chart D for printers, and Chart E for magnetic tape equipment.

COMMUNICATIONS CONTROL

A number of asynchronous, synchronous, and Ethernet communications devices is available for both Q-Bus and Unibus PDP-11 systems.

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CHART E. MAGNETIC TAPE EQUIPMENT

MODEL	TK50	TS05	TU80	TU81-Plus
TYPE	Cartridge	Streaming	Streaming	Streaming
FORMAT				
Number of tracks	22	9	9	9
Recording density, bits per inch	6667	1600	1600	1600/6250
Recording mode	Serial, serpentine pattern	PE	PE	PE/GCR
CHARACTERISTICS				
Controller model	Q-Bus, Unibus TMSCP	Integrated	Integrated	Integrated
Drives per controller	1	1	1	1
Storage capacity, bytes	95M	40M	40M	40M (PE), 145M (GCR)
Tape speed, inches per second	75 (streaming)	25 or 100	25 and 100 (streaming)	75 and 25 (streaming)
Data transfer rate, units per second	45KB-62.5KB	40KB or 60KB	160KB	468KB
Streaming technology	Yes	Yes	Yes	Yes
Start/stop mode; speed	—	Yes; 25 ips	Yes; 25 ips	Yes; 25 ips
Switch selectable	—	—	No	—

Note: A dash (—) in a column indicates that the information is unavailable from the vendor.

15.2 percent of the surveyed systems had been leased from a third party, and 2 percent had been rented or leased from Digital. When questioned about system deployment, the users responded that 20.2 percent of the systems were used for departmental computing, while 78.8 percent were employed for organizational data processing.

The large majority of the systems—61.9 percent—used between 1MB and 4MB of main memory; 29.9 percent had between 256KB and 1MB, and only 8.2 percent had over 4MB. For disk storage, 51.6 percent of the systems had between 100MB and 600MB, while another 18.6 percent employed between 600MB and 1.2GB; 26.9 percent had less than 100MB, and only 3.1 percent used over 1.2GB.

A query about local workstations revealed that 76.8 percent of the respondents had between 6 and 60 local stations. In the remote terminal area, only 23.2 percent fell between the same parameters; 37.4 percent of the respondents said they had between 1 and 5 remote stations, while 36.4 percent of the users reported no remote stations at all.

Commercial applications were most frequently run on the surveyed systems. Payroll/personnel programs were cited by 35.4 percent of the respondents; order processing/inventory systems were mentioned by 33.3 percent of those surveyed. Other applications prominently mentioned were education/scheduling/administration (29.3 percent), purchasing and sales/distribution (23.2 percent each), manufacturing (16.2 percent), engineering/scientific (13.1 percent), and mathematics/statistics (10.1 percent).

Detailing their methods of obtaining applications, 72.7 percent of the users said that they employed in-house personnel; 53.5 percent turned to third-party suppliers. Packaged programs from Digital Equipment were used by 22.2 percent of the respondents; 21.2 percent used contract programming, and another 4 percent obtained customized software from Digital Equipment's personnel.

The *DHV11* is an 8-line asynchronous, direct memory access (DMA) multiplexer that provides local or remote interconnection between Q-Bus PDP-11 systems and EIA RS-232-C/CCITT V.28 terminals or other systems. It operates at program- or jumper-selectable speeds up to 38.4K bps full duplex with full modem control on each line.

The *DZQ11* is a 4-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 *DLVE1* is a single-line asynchronous interface that provides local or remote interconnection between Q-Bus systems and EIA RS-232-C/CCITT V.28 terminals. It operates at program- or jumper-selectable speeds from 50 to 19.2K bps full duplex. Limited modem control is included.

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 *DZV11* is a 4-line asynchronous multiplexer that provides local or remote interconnection between Q-Bus systems and EIA RS-232-C/CCITT V.28 and EIA RS-423-A/CCITT V.10 terminals or other systems. It operates at program-selectable speeds up to 9600 bps full duplex with limited modem control on each line.

The DHV11, the DZQ11, the DLVE1, the DLVJ1, and the DZV11 are all compatible with Digital modems, and 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 *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

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▷ The most popular programming language was Basic, cited by 41.8 percent of the users. Fortran, cited by 19.4 percent, was second in popularity, followed by Cobol (4.1 percent), Assembler (3.1 percent), C (2 percent), and Pascal (1 percent).

When asked if their system did what they expected it to do, 89.9 percent of the users said "Yes"; 4 percent replied in the negative, and 6.1 percent were undecided. When asked if they would recommend the PDP-11 to another user, 87.9 percent of the respondents said that they would, 7.1 percent said that they would not, and 4 percent were undecided.

The following table shows the ratings that the PDP-11 users gave their systems.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	52	44	3	0	3.49
Reliability of system	64	30	4	0	3.61
Reliability of peripherals	52	43	2	1	3.49
Maintenance service:					
Responsiveness	51	39	2	3	3.45
Effectiveness	46	39	5	4	3.35
Technical support:					
Troubleshooting	38	38	13	4	3.18
Education	27	44	17	5	3.00
Documentation	24	47	18	5	2.96
Manufacturer's software:					
Operating system	44	43	6	0	3.41
Compilers & assemblers	34	43	6	0	3.34
Application programs	10	48	10	1	2.97
Ease of programming	28	52	5	0	3.27
Ease of conversion	18	42	16	1	3.00
Overall satisfaction	34	53	3	0	3.34

*Weighted Average on a scale of 4.0 for Excellent.

To supplement the ratings, we contacted four users in September 1986 for some more observations about the PDP-11 systems.

The first user we contacted was affiliated with a college in the Northeast, where a PDP-11/84 is used. She said that those responsible for the purchasing decision had also considered a VAX system but chose the 11/84 because it was able to satisfy their needs and came within their budget. She stated most definitely that they wanted to purchase a Digital product because of the company's reputation for reliable equipment.

This user has not been disappointed in her high expectations for reliability. She reported virtually no trouble with the system, particularly with the hardware. She expressed some disappointment, however, in terms of software availability, and she would like to see Digital bring out more software for the computer. She observed that the amount of software available for the VAX product line far outweighs that available for the PDP-11/84.

Although this user was emphatic in her support of the PDP-11/84, she did admit that future growth would mean moving to a VAX system. The college is already using some VAX equipment, and although no plans are currently in the works, eventually she will go to a VAX too. ▷

▶ 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 the 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 *KMV11-A* 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 KMV11-A can be programmed in synchronous or asynchronous mode.

The DPV11, the DMV11, and the KMV11-A are compatible with Digital modems and Bell 200 series and equivalent modems.

The *DL11* is a single-line asynchronous interface that provides local and remote interconnection between Unibus systems and EIA RS-232-C/CCITT V.28 or 20 ma devices. It operates at switch-selectable speeds from 50 to 9600 bps half or full duplex; full modem control is available on some versions.

The *DH11* is a 16-line asynchronous DMA multiplexer that provides local and remote interconnection between Unibus systems and EIA RS-232-C/CCITT V.28 terminals. The DH11 operates at program-selectable speeds up to 9600 bps, half or full duplex. Full modem control is available on some versions.

The *DZ11* is an 8-line asynchronous multiplexer that provides local and remote interconnection between Unibus systems and up to eight EIA RS-232-C/CCITT V.28 or 20 ma terminals. It operates at program-selectable speeds up to 9600 bps full duplex. Limited modem control is provided.

The DL11, the DH11, and the DZ11 are compatible with Digital modems, as well as with Bell 100 and 200 series 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 (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 8-line programmable, synchronous, intelligent front end that provides interconnection between Unibus systems and other devices with EIA RS-232-C/CCITT V.28, MIL-188-144 unbalanced, 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.

The *KMS11-P* is a one-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 ▶

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The second user we interviewed, affiliated with a manufacturing concern in the Midwest, had a PDP-11/44 installation. Before choosing this model he also considered an unspecified IBM computer, but found that the Digital product was the preferred computer for the accounting and manufacturing software he had chosen. Ease of use was the characteristic of the system that this user appreciated the most. He also praised the programming languages used and the responsiveness of Digital's service.

He further explained that his company has outgrown the 16-bit architecture of the PDP-11/44. The problem isn't intrinsic to the computer itself, but rather that no 16-bit computer would be able to meet his firm's projected needs. He is currently planning to upgrade to a VAX system; he wants to stay with a Digital product. He remarked that the growth path among Digital's system makes it possible to change computers without changing code and rewriting software.

We also spoke with a representative of a college in the West where a PDP-11/44 is used. When purchasing this computer in 1980, this user only considered Digital products. He had already located the data management software he wanted to use, and this software only ran on Digital products. He also considered the PDP-11/70, but found it to be too expensive.

The installed PDP-11/44 uses the RSTS/E operating system, which has worked very satisfactorily for this user. He did state that he would like to see Digital continue to support RSTS/E. He opined that there was once some question of how much support Digital would put into RSTS/E, and he would like to see the vendor continue to upgrade it.

This user reported virtually no problems with the system. The computer is used basically for administrative data management, and it satisfies the college's needs quite well. There is an occasional slowdown when batch jobs are run at a time when a lot of terminals are working, but that doesn't significantly affect the overall performance of the system. He stated that eventually he would probably have to upgrade to a VAX system, suggesting that this is the eventual route for all Digital customers.

Finally, we spoke with a user who works for an engineering firm in the Mid-Atlantic states. Her firm uses both a PDP-11/23-Plus and a PDP-11/24. The PDP-11/23-Plus is used mostly for accounting tasks, and the PDP-11/24 is used for scheduling and processing purchase orders. This user said that she is mostly involved with the PDP-11/24 running the RSX-11M-Plus operating system. She is very pleased with its performance.

She reported no problems with the system, stating that it does exactly what it's supposed to do. She would like to see Digital offer an intelligent terminal for the system that could run independent software. To satisfy its need to run electronic spreadsheets, this firm purchased an IBM PC AT. Data is downloaded from the PDP-11/24 to the IBM micro, where it is manipulated via an electronic

bps half or full duplex with full modem control. The KMS11-P supports DMA data transfers and the X.25 protocol.

The *DMP11* is a microprocessor-controlled, single-line synchronous interface that provides local or remote interconnection between Unibus systems and other computer systems with EIA RS-423/CCITT V.10, EIA RS-422/CCITT V.11, EIA RS-232-C/CCITT V.28, or CCITT V.35 interfaces. The DMP11 implements DDCMP in hardware and supports DMA data transfers, DECnet point-to-point or multipoint configurations, and full modem control. It operates half duplex at 1M bps, and half and full duplex for other rates. Depending upon the operating system and layered software, the DMP11 can support up to 32 tributaries. In multipoint configurations, these tributaries can be other DMP11s or DMV11s. In point-to-point configurations, the DMP11 can communicate with any other synchronous interface that implements DDCMP Version 3.1 or 4.0. The DMP11 is compatible with Digital modems and with Bell 200 series and 500all/5 modems and their equivalents.

The *DFM Series* of statistical multiplexers are intelligent, standalone communications processors that support direct memory access, synchronous and asynchronous operation, optional integral modems (4800 and 9600 bps), and expansion from 4 to 16 lines. They also feature EIA RS-232-C/CCITT V.28 dial-up support; synchronous channel input on up to 50 percent of the channels of 1200 to 9600 bps; asynchronous input speeds of 50 to 9600 bps with autobaud above 150 bps; and concentrated link speeds of 1200 to 19.2K bps.

For information on the following communicatons devices, please see the "DEC VAX 8000 Systems" report in this section of DATAPRO REPORTS ON MINICOMPUTERS: DHU11 asynchronous multiplexer; DMR11 synchronous interface; DEUNA and DELUA Ethernet-to-Unibus communications controllers; H4000 and H4005 Ethernet transceivers; and DELNI local network interconnect.

SOFTWARE

OPERATING SYSTEMS: The major operating systems for the PDP-11 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, Micro/RSX, and DSM-11. Several other operating systems are available, including Ultrix-11, CTS-300, and MicroPower/Pascal-RT.

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, memory for user programs is divided into two separate regions. Two independent programs, therefore, can reside in memory and effectively share the resources of the system. The foreground program is given priority and executes until it relinquishes control to the background program, and vice versa. RT-11 also supports indirect command files, permitting execution of streams of commands contained in individual files. RT-11 also includes a batch facility.

RSTS/E (Resource Sharing Timesharing System/Extended) is an interactive, multiuser, timesharing, resource-sharing, general-purpose 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 the

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▷ spreadsheet package. This arrangement is working, but this user would like to see the same type of system available from Digital.

In describing the PDP-11/24, this user said the equipment is working reliably and satisfactorily, but it is outdated. She speculated that her firm could probably purchase more powerful equipment in today's market for less money than it spent on the PDP-11/24. She further suggested that eventually her firm will probably upgrade to a PDP-11/84 or a VAX system, although no such move is currently planned. □

➤ **Sort-11 utility.** RSTS/E systems support concurrent interactive timesharing, transaction processing, batch processing, and program development.

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.

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 10 jobs. Micro/RSTS uses the DCL command language, which is specifically designed for users with limited computer knowledge. The system does not support communications using DECnet 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; the Files-11 data management services file system that provides volume structuring and protection; FCS (File Control Services); a basic file handling system; RMS-11, a superset of FCS; and the EDI and EDT editors.

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 48KB of memory.

The *RSX-11M-Plus* operating system is a superset of the RSX-11M operating system. It takes advantage of the expanded addressing capability of the PDP-11/84 while maintaining the architecture of the RSX-11M operating system. RSX-11M-Plus supports up to 50 simultaneous users and 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 64KB of each simultaneously.

Standard on RSX11M-Plus systems are the Macro-11 assembly language and the Files-11 data management services file system that provides volume structuring and protection, FCS, RMS-1K, and the EDI and EDT editors. In addition, RSX-11M-Plus supports DCL (Digital's standard command language), multistream batch processing, accounting, dynamic dual-ported disks, additional memory management capability, and more simultaneous tasks and terminals than RSX-11M.

RSX-11S is a memory-based subset of the RSX-11M operating systems. RSX-11S provides a runtime environment for execution of tasks on a memory-based processor. Memory resident application programs require the support of a disk-based host system like RSX-11M or RSX-11M-Plus for program development. RSX-11S has most of the RSX-11M features and generation capability, and supports all of the peripheral devices that are supported under RSX-11M. Other features included on RSX-11S are a monitor console routine, on-line task loader, system image preservation program, and file control services for record devices.

Micro/RSX is an extended subset of the RSX-11M-Plus operating system for the Micro/PDP-11. It can support up to 10 users and 14 terminals in both realtime and timesharing environments. Micro/RSX is packaged on an RX50 diskette and is customer installable. Micro/RSX comprises two separate packages: the Base Kit and the Advanced Programmer's Kit.

The *DSM-11* operating system is a multiuser data management system that consists of an interactive high-level programming language, Digital Standard Mumps (Massachusetts General Hospital Multiprogramming System), a data management facility, and a timesharing executive. Digital Standard Mumps, an extension of the American National Standard Specification, is a high-level language oriented toward solving data base problems, and is intended for use by programmers with little programming experience. Other features of the DSM-11 operating system are high-performance data base handler; distributed data base management; online, high-speed, data base backup; automatic powerfail restart capability; and hardware device error reporting, system patching utility, and executive debugger for system maintenance.

Ultrix-11 is an interactive, timesharing, native Unix operating system based on the AT&T Version 7 Unix Timesharing System. It features a hierarchical file system with demountable volumes; compatible file, device, and interprocess I/O; asynchronous processes; a system command language selectable on a per-user basis; a C compiler; and Fortran 77. Ultrix-11 also incorporates the Berkeley Unix full screen editor, a version of the Berkeley User Overlay Scheme for large programs, the Unix System III Source Code Control System (SCCS) plus the Berkeley SCCS interface program, and certain Unix System V commands. Ultrix-11 is compatible with Ultrix-32 and Ultrix-32m, the Berkeley-Unix-based systems for the VAX family.

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 of three runtime systems; Single-User Dibol (SUD), Time-shared dibol (TSD), and Extended Memory TSD; 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. ➤

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▶ *MicroPower/Pascal-RT* is a modular operating system and software development package; it is used to create microcomputer applications on PDP-11 systems. It includes a subset of the RT-11 operating system, an optimizing Pascal compiler, and programming, testing, and debugging tools.

DATABASE MANAGEMENT SYSTEMS: PDP-11 systems do not employ separate data base management systems.

LANGUAGES: Digital offers the following major programming languages for the PDP-11 family of computers: Fortran; Dibol-83; Micro/RSX Dibol; Basic-RT-11; Micro/RSX Basic-Plus-2; Micro/RSTS Basic-Plus-2; Basic-Plus-2; Coral 66; Cobol-81; Micro/RSX Cobol-81; Fortran-77; Micro/RSX Fortran-77; and PDP-11 Pascal.

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

Communication with other Digital computer systems and networks is 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 a complete description of DECnet, please see the DECnet-VAX description in the Communications section of the "DEC VAX 8000 Systems" report in this section of DATA-PRO REPORTS ON MINICOMPUTERS.

Interconnection of Digital systems with computers built by other manufacturers is supported by a family of products called *Internets*. Digital's protocol emulator (PE) products provide a way for Digital computers and terminals to communicate with computers and terminals built by IBM, Control Data, and Sperry (Univac) by imitating those manufacturers' terminal and line products. Internet products are discussed in the following paragraphs.

The *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 *RSTS/E 2780 Emulator* emulates the communications protocol of an IBM 2780 device while running as a user job under a suitably configured Unibus-based RSTS/E system.

The *RSX-11 and RSTS/E 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 or CICS on an IBM 370 host.

RSX-11M/IAS RJE/Hasp performs the standard functions of an IBM Hasp Remote Job Entry Workstation. The Hasp PE user can communicate directly with the IBM mainframe from a local terminal to control and check the status of jobs on the IBM host.

RJE Hasp provides multileaved (pseudosimultaneous, bidirectional) communications of up to 7 input and 7 output datastreams. Any mass storage or unit record device supported by RSX-11M or RSX-11M-Plus can be used as a source or destination of data for a Hasp datastream.

The *RSX-11M/SNA Protocol Emulator* provides an RSX-11M system with the ability to participate in an IBM Systems Network Architecture (SNA) network, communicating with IBM application programs or system services on a task-to-task basis.

DECnet/SNA Gateway routines allow Digital systems to share information with IBM systems running under SNA. The Remote Job Entry (RJE) routine allows the user on a DECnet node to perform as a remote SNA workstation or group of workstations and transmit batch jobs to an IBM host and receive job output; the node appears to the user as a turnkey package operating with JES2 or JES3 software on an IBM mainframe. The 3270 Terminal Emulator (3270 TE) routine allows the user of Digital Equipment VT100 or VT200 or compatible devices to interact with an IBM system running programs written for 3270 users. The Application Program Interface enables a user-written application in a DECnet node to exchange messages with a cooperating application in an IBM host. The Gateway Network Management routine controls the DECnet-to-SNA interface. It includes normal DECnet network management activities, troubleshooting, and monitoring of SNA/SDLC lines.

Mux200/RSX-IAS provides communications with a Control Data Cyber series or other system using the 200UT Mode 4A communications protocol. The PDP-11 user can communicate at command level with a host system, submitting jobs for batch processing and receiving results from the host.

UN1004/RSX provides communication between a Unibus-based RSX-11M system and a Sperry 1100 series or another type of system using the Univac 1004 RMS-1 communications protocol.

Digital also provides *Packetnet System Interfaces (PSIs)* for PDP-11 systems; these products include an X.25 Protocol Interface, an Interactive Terminal Interface, and RSX-11 PSI. RSX-11 PSI has two subsets, RSX-11 PSI/M and RSX-11 PSI/M-Plus, that allow suitably configured RSX-11M and RSX-11M-Plus operating systems to connect to public packet-switching networks (PPSNs) conforming to the CCITT recommendation of June 1980. These PSI products support task-to-task communication via the network and remote terminal communication through a packet assembler/disassembler (PAD) facility provided by the network.

UTILITIES: *Sort-11* is an optional data sorting utility that can accept as input any RMS-11 format file and output a reordered RMS-11 format file. Input files can contain data stored in binary, EBCDIC, or ASCII format, and the file organization can be sequential, relative, or indexed sequential. Sort-11 provides four different user-selectable sorting processes.

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. Micro/RSX Datatrieve-11, for the Micro/RSX environment, is also available.

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/LXY22 line printers/plotters.

Applications Development Environment (ADE) is a programming tool specifically designed for nonprogrammers to use in developing and running small, simple applications for use in small businesses.

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

DEC PDP-11 Family

▶ *MicroPower/Pascal-RSX* is a modular software development package for microcomputer applications. It includes an optimizing Pascal compiler and tools to create, build test, and debug concurrent realtime application programs running under the RSX-11M or RSX-11M-Plus operating system. The target system for the application can be any Digital Q-Bus or extended Q-Bus processor.

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.

DECword/DP is a software package that puts fully featured word processing in the RSTS/E and Micro/RSTS timesharing environments. It can be run from any terminal on a system under one of those environments, and gives end users the type of text-manipulation features usually associated with standalone word processor equipment.

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.

DECmail-11 is a command-driven electronic mail system available for RSTS/E, Micro/RSTS, RSX-11M-Plus, and Micro/RSX. 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 numerous data management, program development, and graphics applications for PDP-11 systems. In addition, over 2,000 third-party applications are available for the systems.

A-to-Z software is a group of general-purpose application and office packages for MicroPDP-11 systems. The A-to-Z Integrated System, layered on Micro/RSX, provides menu and system management functions, and allows users to install and modify Micro/RSX applications. Word Processing, Electronic Mail, and Business Graphics modules are also available, as are a Data Inquiry module, for hard copy reports and terminal-based inquiries, and an Integration Kit, for creation and migration of software packages targeted for the A-to-Z Integrated 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: Hardware products are warranted against defects in material and workmanship for 90 days, either from date of installation completion, or, if Digital does not do the installation, from date of delivery. Digital warrants software products classified as "Digital-Supported" for 90 days; the warranty is generally received by the customer after the product is installed or 30 days after delivery, depending upon which date comes first.

For information on the hardware and software services offered by Digital Equipment, refer to the "DEC VAX 8000 Systems" report in this section of DATAPRO REPORTS ON MINICOMPUTERS.

TRAINING: For details on the types of training available from Digital Equipment, refer to the "DEC VAX 8000 Systems" report in this section of DATAPRO REPORTS ON MINICOMPUTERS.

TYPICAL CONFIGURATIONS: Sample configurations for the MicroPDP-11/53, MicroPDP-11/83, and PDP-11/84 are provided in the following tables. Complete hardware and software prices follow these configurations.

MicroPDP-11/53:

DH-153Q1-AA Pedestal/Tabletop System; includes CPU, 512KB of main memory, RD31 20MB Winchester disk drive, RX33 1.2MB diskette drive, RQDX3 disk controller, BA23 enclosure, two serial lines for console terminal and printer, power cord, documentation, and installation diagnostics	$ 9,700
MSV11-QA 1MB add-on memory	1,250
RD31A-AB 20MB add-on Winchester disk drive	1,500
DZQ11-M 4-line async multiplexer	680
Five VT220-A2 terminals and keyboards	5,475
LN03-AA 8-ppm laser printer	3,495
TOTAL PURCHASE PRICE:	**$22,100**

MicroPDP-11/83:

DH-183Q3-AA Cabinet Standard System; includes CPU with Floating-Point Accelerator, 2MB of main memory, RA81 456MB Winchester disk drive, KDA50 disk controller, TK50 95MB tape drive with controller, serial line for console terminal, two DHV11 async multiplexers (16 lines), H9642 cabinet with dual BA23 boxes, power cord, documentation, and installation diagnostics	$50,930
MSV11-JD 1MB add-on memory	2,400
17 VT220-A2 terminals and keyboards	18,615
LN03 8-ppm laser printer	3,495
TOTAL PURCHASE PRICE:	**$75,440**

PDP-11/84:

SX-JXEDA-EX RA81/TU80 Standard System; includes CPU, 2MB of main memory, RA81 456MB Winchester disk drive, TU80 40MB streaming tape drive, DHU11 16-line async multiplexer, H9642 cabinet and power controller, and console cable	$64,000 $64,000
MSV11-JB 1MB add-on memory	2,400
RA81-AA add-on 456MB Winchester disk drive	19,000
DHU11-M 16-line async multiplexer	3,420
32 VT220-A2 terminals and keyboards	35,040
Two LN03 laser printers	6,990
TOTAL PURCHASE PRICE:	**$130,850** ▶

DEC PDP-11 Family

EQUIPMENT PRICES

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)

MicroPDP-11/53 BASE AND BOX SYSTEMS

DH-153Q1-AA	MicroPDP-11/53 floor/table system; includes CPU, 512KB on-board memory, 20MB RD31 disk, 1.2MB RX33 diskette, BA23-A enclosure, BA-23-AF kit, documentation, and diagnostics	9,700	85	101
DH-153Q1-A2(A3)	Same as DH-153Q1-AA, except no documentation or diagnostics	9,420	85	101
DH-153Q2-AA	Same as DH-153Q1-AA, but rackmount model	9,570	85	101
DH-153Q2-A2(A3)	Same as DH-153Q1-A2(A3), but rackmount model	9,270	85	101

MicroPDP-11/73 BASE AND BOX SYSTEMS

DH-173Q1-BA	MicroPDP-11/73 floor/table system; includes CPU, 1MB parity MOS memory, 71MB RD53 disk drive, RQDX3 disk controller, 95MB TK50 drive and tape controller, 8-line multiplexer, BA23-A enclosure, 120 V power cord, documentation, and diagnostics	18,345	179	213
DH-173Q1-B2(B3)	Same as DH-173Q1-BA, except no diagnostics or documentation	18,045	179	213
11H73-AA(AB)	MicroPDP-11/73 system; includes 512KB parity MOS memory and 52MB RC25 fixed/removable disk in H9642 cabinet	19,500	109	130

MicroPDP-11/73 SYSTEM BUILDING BLOCKS

Each MicroPDP-11/73 System Building Block (SBB) includes a CPU, 1MB parity MOS memory, one asynchronous console serial line, BC22D-10 serial-line cable, BA23A-AF pedestal/table enclosure, and 120 V power cord. In addition, a selection must be made from the mass storage (system device and load device) menu. (System devices are the 31MB RD52 Winchester and the 71MB RD53 Winchester; load device options are the RX50 diskette and the TK50 cartridge tape.) Selections from the communications device, console terminating and software license menus are optional.

173QY-C2(C3)	MicroPDP-11/73 SBB with BA23A-AF floorstand/tabletop kit	10,250	80	95
173QZ-C2(C3)	MicroPDP-11/73 SBB with BA23A-AR rackmount kit	10,100	80	95

MicroPDP-11/83 BASE AND BOX SYSTEMS

DH-183Q2-AA	MicroPDP-11/83 floorstand system; includes CPU with FPA, 2MB PMI memory, (2) 71MB RD53 disk drives, RQDX3 disk controller, 95MB TK50 controller, 95MB TK50 tape drive and controller, (2) DHV11 multiplexers, 120 V power cord, documentation, and diagnostics	34,660	245	292
DH-183Q2-A2(A3)	Same as DH-183Q2-AA, except no documentation or diagnostics	34,360	245	292
DH-183Q3-AA	MicroPDP-11/83 cabinet system; includes CPU with FPA, 2MB PMI memory, 456MB RA81 disk drive, KDA50 disk controller, 95MB TK50 tape drive and controller, (2) DHV11 multiplexers, H9642-style cabinet w/dual BA23 boxes, 120 V power cord, documentation, and installation diagnostics	50,930	304	362
DH-183Q3-A2(A3)	Same as DH-183Q3-AA, except no documentation or diagnostics	50,630	304	362

MicroPDP-11/83 SYSTEM BUILDING BLOCKS

Each MicroPDP-11/83 System Building Block (SBB) includes a CPU with FPA, 2MB PMI memory, asynchronous console serial line on the CPU module, and serial line cable. In addition, a selection must be made from the integrated mass storage menu. (Choices include 205MB RA60 removable disk, 456MB RA81 fixed disk, 71MB RD53 fixed disk, 40MB RSV05 streaming tape, 95MB TK50 cartridge tape, and 800KB RX50 diskette drive.) Selections from the communications device, console terminal, and software license menus are optional.

183QB-D2(D3)	MicroPDP-11/83 SBB with BA123 cabinet	18,700	93	111
183QE-D2(D3)	MicroPDP-11/83 SBB with H9642 cabinet	22,600	99	118

PDP-11/84 SYSTEM BUILDING BLOCKS

SK-JX100-EX(EY)	PDP-11/84 System Building Block. Includes CPU, 2MB PMI ECC memory, DHU11-A 16-line async multiplexer, H9642 cabinet and cable	28,500	300	357

PDP-11/84 STANDARD SYSTEMS

SK-JXEDA-EX(EY)	PDP-11/84 packaged system; includes CPU, 2MB PMI ECC memory, DHU11-A 16-line async multiplexer, 456MB RUA81 fixed disk and controller, 40MB TU80-A 9-track magnetic tape, H9642 cabinet and cable	64,000	515	613
SK-JXNNA-EX(EY)	PDP-11/84 packaged system; includes CPU, 2MB PMI ECC memory, DHU11-A 16-line async multiplexer, 104MB RUC25-C fixed/removable disk, H9642 cabinet and cable	49,500	372	443

NA—Not applicable.
NC—No charge.
Note: A dash for an entry indicates that the information is unavailable from the vendor.

DEC PDP-11 Family

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)

PROCESSOR OPTIONS AND MEMORIES

Q-Bus System Options (MicroPDP-11/53, -11/73, and -11/83)

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
FPF11	Single- and double-precision floating point; operates on 32-bit and 64-bit floating point numbers; microcode resides on one quad module mounted adjacent to CPU	1,000	65	77
KEF11-AA	Single- and double-precision floating point; performs hardware operations on 32-bit and 64-bit floating point numbers; mounts on CPU board	225	NC	NC
KEF11-BB	Commercial Instruction Set (CIS); implements a set of 27 commercial instructions on data types including character strings, packed decimal, and numeric formats; mounts on CPU board	495	NC	NC
MCV11-DC	32KB CMOS static Random Access Memory with on-board battery backup	990	21	25
MSV11-LK	256KB MOS memory	700	29	35
MSV11-JD	1MB ECC PMI memory	2,400	16	19
MSV11-JE	2MB ECC PMI memory	2,900	32	38
MSV11-QA	1MB 64K-bit MOS memory	1,250	29	35
MSV11-QB	2MB 256K-bit RAM MOS memory	1,700	36	43
MSV11-PK	256KB parity MOS memory	1,000	29	35
MSV11-PL	512KB parity MOS memory	900	58	69

MASS STORAGE

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
KDA50-QA	Q-Bus controller for SDI disk drives	5,500	50	60
RQDX3-AA	Q-Bus controller and cables for BA23 enclosure	1,840	16	19
RQDX3-BA	Q-Bus controller, cables, and distribution panel for BA123 enclosure	1,840	16	19
RQDX3-M	Q-Bus controller with no cables	1,790	16	19
RQDXE-AA	Dual-height disk drive bus extender module for use with the RQDX2 or RQDX3 disk controller in a BA23 enclosure	250	NA	NA
UDA50-A	Unibus controller for SDI disk drives	5,500	53	63
RUA80-UA(UD)	Additional UDA50 controller with cable; for dual-porting RA80, RA81, and RA60 disks	5,500	32	38
RA80-AA(AD)	RA80 rackmount 121MB disk drive (no cabinet); requires UDA50 controller and cabinet for mounting	14,000	85	101
RA80-CA(CD)	RA80 cabinet-mounted 121MB fixed disk drive; requires UDA50 controller	16,500	85	101
RQA81-AA/AD	RA81-AA/AD with KDA50 controller	24,500	145	173
RQA81-CA/CD	RA81-CA/CD with KDA50 controller	27,000	145	173
RA81-AA(AD)	RA81 rackmount disk drive (no cabinet); requires UDA50 controller and H9642-AP(AR) cabinet	19,000	95	113
RA81-CA(CD)	RA81 cabinet-mounted disk drive; requires UDA50 controller	21,500	95	113
RA81-EA(ED)	Three cabinet-mounted RA81 drives; requires UDA50 controller	50,000	284	338
RA81-FA/FD	One RA81 disk drive with 4-HI cabinet	23,000	95	113
RA81-HA/HD	RA81 rackmount disk drive (no cables)	18,640	95	113
RA81JA/JD	Four RA81 disk drives mounted in a 4-HI cabinet	68,000	380	452
RA81-UA	RA81 reconfiguration kit	400	NA	NA
RA60-AA	RA60 rackmount disk drive (no cabinet); requires H9642-AP(AR) cabinet and UDA50 controller	17,500	105	125
RQA60-AA	RA60-AA with KDA50 controller	23,000	155	185
RA60-AF	RA60 disk drive for MicroPDP-11/83	17,140	105	125
RA60-CA(CD)	RA60 cabinet-mounted disk drive; requires UDA50 controller	20,000	105	125
RQA60-CA/CD	RA60-CA/CD with KDA50 controller	25,500	155	185
RA60-EA/ED	Three RA60 disk drives in 3-HI cabinet	49,000	315	375
RA60-JA/JD	Four RA60 disk drives in 3-HI cabinet	66,000	420	500
RA60-FA/FD	RA60 disk drive in a 4-HI cabinet	21,500	105	125
RA60-UA	RA60 reconfiguration kit	400	NA	NA
RL211-AK	RL02 rackmount, top-loading 10.4MB cartridge disk drive and controller to interface to the PDP-11 Unibus	7,900	75	89
RLV22-AP	RL02 cartridge disk subsystem; same as RL211-AK, except controller interfaces to the Q-Bus on MicroPDP-11 systems	7,900	77	92
RL02-AK	Add-on cartridge disk drive	4,200	72	86
RLV12-AP	RLV12 controller; interfaces 1-4 RL01 or RL02 drives to the Q-Bus. System option includes module, internal cables, and I/O connector panel insert. Must be ordered with the system in which it will be installed.	4,300	15	18
RLV22-AK	Base option for the Q-Bus; requires cabinet kit	7,900	78	93
RD31A-AA/AB	20MB Winchester disk	1,500	10	12
RD52-A	RD52 31MB Winchester disk drive; for addition to MicroPDP-11 system enclosure	3,000	19	23
RD52A-AA	31MB fixed disk with cables for BA23 enclosure	3,000	19	23
RD52A-BA	31MB fixed disk with cable for BA123 enclosure	3,000	19	23
RD52-DA(DB)	RD52 31MB Winchester drive in desktop enclosure with I/O cable	3,600	19	23
RD52-RA(RB)	RD52 rackmount 31MB Winchester disk drive; requires enclosure	3,600	19	23
RD53-A	71MB fixed disk drive	4,050	38	45

NA—Not applicable.
NC—No charge.
Note: A dash for an entry indicates that the information is unavailable from the vendor.

DEC PDP-11 Family

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
RD53A-AA	71MB fixed disk drive with cables for BA23 enclosure	4,050	38	45
RD53A-BA	71MB fixed disk drive with cables for BA123 enclosure	4,050	38	45
RD53-DA/DB	71MB fixed disk drive in desktop enclosure with I/O cables	4,650	38	45
RD53-RA/RB	71MB fixed disk drive for mounting 19-inch standard rack	4,650	38	45
RX211-BK(BM, BN)	RX02 dual disk subsystem; includes two 0.5MB RX02 drives and controller to interface to PDP-11 Unibus; rackmount	4,150	53	63
RXV21-EP(ES, ET)	RX02 tabletop dual disk subsystem; includes two 0.5MB RX02 drives and controller to interface to the Q-Bus on MicroPDP-11 systems	4,500	53	63
RXV21-EA(ED, EC)	Tabletop upgrade option for the Q-Bus; requires a cabinet kit	4,430	53	63
RX33-A	1.2MB diskette drive	650	8	10
RX33A-AA	RX33 with cables for BA23 enclosure	650	8	10
RX33A-BA	RX33 with cables for BA123 enclosure	650	8	10
RX50-AA	RX500 0.8MB diskette drive; for addition to MicroPDP-11 system enclosure	900	8	10
RX50-D	RX50 0.8MB diskette drive in desktop enclosure; includes I/O cable	1,500	20	24
RX50-R	RX50 0.8MB rackmount diskette drive; requires enclosure	1,500	20	24
RUX50-YA	Intelligent quad-size, single board Unibus controller; interfaces up to two RX50 0.8MB dual diskette drives; includes 9-ft. (2.7-m) I/O cable; requires an RX50-D when a desktop unit is added to a PDP-11 Unibus system, and an RX50-R and rackmount chassis when a rackmount unit is added to a PDP-11 Unibus system	1,300	12	14
RUC25-AA(AB)	Tabletop RC25 52MB (26/26) fixed/removable disk drive	12,500	39	46
RUC25-BA(BB)	Rackmount RC25 52MB fixed/removable disk drive with Unibus controller; mounts in H9642-F and H9642-M Unibus expansion cabinets	12,500	39	46
RQC25-AA(AB)	Tabletop RC25 52MB fixed/removable disk drive with Q-Bus controller	12,500	39	46
RQC25-BA(BB)	Rackmount RC25 52MB fixed/removable disk drive with Q-Bus controller	12,500	39	46
RQC25-CA(CB)	Rackmount dual RC25 52MB fixed/removable disk drives with Q-Bus controller	21,000	72	—
RC25-DA(DB)	Tabletop add-on RC25 52MB fixed/removable disk drive	5,500	33	39
RC25-EA(EB)	Rackmount add-on RC25 52MB fixed/removable disk drive; mounts in H9642-F and H9642-M Unibus expansion cabinets;	5,500	33	39
RX50A-BA	0.8MB dual diskette drive for BA123 enclosure	900	8	10
RUX50-YA	Unibus controller for RX50	1,300	12	14
RUX50-YP	Unibus controller for RX50 system option	1,400	12	14

MAGNETIC TAPE

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
TQK50-AA	Q22-bus TMSCP controller for TK50-AA tape drive; with 30-inch cable for installation in BA23-A box	995	8	10
TQK50-BA	Q22-bus TMSCP controller for TK50-AA; with 30-inch cable for installation in BA123-A box	995	8	10
TQK50-AB	Q22-bus TMSCP controller for TK50-D/R tape drive; with 14-inch cable and distribution insert for installation in BA23-A box	995	8	10
TQK50-BB	Q22-bus TMSCP controller for TK50-D/R tape drive; with 21-inch cable and distribution insert for installation in BA123-A box	995	8	10
TQK50-RB	Q22-bus TMSCP controller for TK50-D/R tape drive; with 120-inch cable and bulkhead plate used in non-FCC-compliant cab installations	995	8	10
TUK50-BB	Unibus TMSCP controller for TK50-D/R; with cable and bulkhead for PDP-11/84	1,895	8	10
TSV05-AA(AB, AC, AD)	Q-Bus TS05 1600-bpi, 25-/100-ips magnetic tape system with hardware for rackmounting, control module, and cables; for MicroPDP-11 systems	8,995	89	106
TSV05-BA(BB, BC, BD)	Q-Bus TS05 magnetic tape system mounted in a 41.7-in. (106-cm) H9642 cabinet with power controller and 21 in. (53.3 cm) of expansion space; for MicroPDP-11 systems	10,995	89	106
TSV05-ZA(ZB/ZC/ZD)	Q-bus TS05 magnetic tape system, rackmount with cables, control module, cover. For MicroPDP-11/83 only	9,995	89	106
TSU05-AA(AB, AC, AD)	Unibus TS05 1600-bpi, 25-/100-ips magnetic tape system with hardware for rackmounting, control module, and cables; for PDP-11/84	13,500	89	106
TU80-AA(AB)	TU80 magnetic tape subsystem; 1600-bpi, 25-/100-ips, half-inch magnetic tape subsystem; employs start/stop and streaming tape technology; interfaces to any Unibus system; includes tape drive cabinetry	12,500	89	106
TU8IE-AA/AB	TU81-Plus magnetic tape subsystem, Unibus interface	11,000	222	264

TERMINALS

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
VT220-A2(A3)	VT220 video terminal with white phosphor nonglare screen	880	12	14
VT220-B2(B3)	VT220 video terminal with green phosphor nonglare screen	880	12	14
VT220-C2(C3)	VT220 video terminal with amber phosphor nonglare screen	880	12	14
VT22K-AA	Data processing country kit (including keyboard) for VT220; for U.S. and English-speaking Canada	215	NC	NC
VT22K-BA	Word processing country kit (including keyboard) for VT220; for U.S. and English-speaking Canada	215	NC	NC
VT240-A2(A3)	Monochrome graphics terminal with white phosphor nonglare screen; includes monitor, keyboard, and system box	1,980	19	23

NA—Not applicable.
NC—No charge.
Note: A dash for an entry indicates that the information is unavailable from the vendor.

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DEC PDP-11 Family

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
VT240-B2(B3)	Monochrome graphics terminal with green phosphor nonglare screen; includes monitor, keyboard, and system box	1,980	19	23
VT240-C2(C3)	Monochrome graphics terminal with amber phosphor nonglare screen; includes monitor, keyboard, and system box	1,980	19	23
VT241-AA	Color graphics terminal for U.S. and English-speaking Canada; includes monitor, keyboard, and system box	2,980	26	31
VT24K-AA	Data processing country kit (including keyboard) for VT240 and VT241; for U.S. and English-speaking Canada	215	NC	NC
VT24K-BA	Word processing country kit (including keyboard) for VT240 and VT241; for U.S. and English-speaking Canada	215	NC	NC
LA12-DB	LA12 tabletop and console model with EIA interface only	1,495	21	25
LAX12-U2	Dial-through keyboard 1200-baud integral modem upgrade for LA12-CB, -DB	600	NC	NC
LAX12-U4	300-baud acoustic coupler upgrade for LA12-DB	100	NC	NC
LA100-BA	Letterwriter 100 keyboard send/receive hardcopy terminal with numeric keypad, tractors, cable, ribbon cartridge, package of paper, Courier-10/Orator-10 fonts in U.S./U.K. character sets	2,195	27	32
LA100-BB	Letterwriter 100 keyboard send/receive hardcopy terminal with numeric key, tractors, cable, ribbon cartridge, one package of paper, Courier-10 font, international overlay, and VT100 line drawing set	2,195	27	32
LA100-CA	Letterwriter 100 keyboard send/receive hardcopy terminal with tractors, cable, ribbon cartridge, one package of paper, Courier-10/Orator-10 fonts in U.S./U.K. character sets, and multiple font option	2,295	27	32
LA100-CB	Letterwriter 100 keyboard send/receive hardcopy terminal with tractors, cable, ribbon cartridge, one package of paper, Courier-10 font, international overlay, VT100 line drawing set, and multiple font option	2,295	27	32
LA120-DA	LA120 DECwriter keyboard send/receive hardcopy terminal; accommodates 1- to 6-part forms	2,800	34	40

COLOR GRAPHICS SYSTEM

VSV21-AA	Q-bus raster graphics module	3,895	40	48
VSV-AB	BA23 distribution kit	300	NC	NC
VSV21-AC	BA123 distribution kit	300	NC	NC
VSV21-BB	VSV21-AA plus VSV21-AB	4,095	40	48
VSV21-BC	VSV21-AA plus VSV21AC	4,095	40	48

VOICE SYNTHESIS MODULE

DTC01-AA	DECtalk voice synthesis module; English-speaking text to speech board, speech analog, and telephone output	4,000	22	11

PRINTERS

LA50-RA	LA50 tabletop printer (50-/100-cps) with push tractor feed, 110 VAC power supply	695	8	10
LA50-RB/RC	LA50 tabletop printer (50-/100-cps) with push tractor feed, 220/240 VAC power supply	715	8	10
LA50-RD	LA50 tabletop printer with push tractor feed, 100 VAC power supply	715	8	10
LA210-AA	40-/80-/240-cps letterprinter with power cord and documentation	1,595	28	33
LG01-AA	Unibus 600-lpm text printer in 64-character data processing mode	11,950	128	152
LG01-BA	Q-bus 600-lpm text printer in 64-character data processing mode	11,950	127	151
LG02-AA	Unibus 600-lpm text and graphics printer in 64-character data processing mode	14,000	128	152
LG02-BA	Q-bus 600-lpm text and graphics printer in 64-character data processing mode	14,000	127	151
LG02-DA	600-lpm text and graphics printer in 64-character data processing mode with cable and interface	14,000	118	140
LQP02-AA(AD)	LQP02 32-cps letter-quality printer with Courier-10 font	2,800	37	44
LQPX2-AA	Bidirectional forms tractor option for fanfold paper	250	NC	NC
LQPX2-SF	Dual-tray cutsheet feeder with envelope tray	1,800	19	23
LQP03-A	LQP03 25-cps, 120 V/60 Hz letter-quality printer with 130-character print wheel and U.S. power cord	1,395	23	27
LQP03-B	LQP03 25-cps, 220-240 V/50 Hz letter-quality printer with 130-character print wheel	1,395	23	27
LQPX3-SF	Single-tray sheet feeder	695	8	10
LQPX3-FT	Bidirectional tractor	245	NC	NC
LN01S-CA	LN01S 12-ppm laser printer with 12 standard Courier-like fonts, LP11 interface, and 30-ft. (9.1-m) cable	19,995	353	420
LN03-AA	LN03 8-ppm laser printer with two toner cartridges, one OPC cartridge, cord, one toner collection bottle, one package of paper, and documentation	3,495	49	58

NA—Not applicable.
NC—No charge.
Note: A dash for an entry indicates that the information is unavailable from the vendor.

DEC PDP-11 Family

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
LNO3S-AA	LNO3 Plus 8-ppm laser printer with 1MB RAM, 14-point Modern Gothic typeface, two toner cartridges, one OPC cartridge, cord, one toner collection bottle, one package of paper, and documentation	4,995	56	67
LP11-AA	LP25 band printer; 300 lpm for 64 ASCII character set; for Unibus systems	8,350	105	125
LP11-BA	LP25 band printer; 300 lpm for 64 ASCII set or 215 lpm for 96 ASCII character set; for Unibus systems	8,950	105	125
LPV11-AP	LP25 Q-Bus systems band printer; 300 lpm for 64-character set	8,350	105	125
LPV11-BP	LP25 Q-Bus systems band printer; 300 lpm for 64-character set or 215 lpm for 96-character set	8,950	105	125
LPV11-A	LP25 Q-Bus upgrade option; 300 lpm for 64-character set; requires cabinet kit	8,300	105	125
LPV11-B	LP25 Q-Bus upgrade option; 300 lpm for 64-character set; requires cabinet kit	8,900	105	125
LP11-EA	LP26 Unibus systems band printer; 600 lpm for 64-character set	13,600	150	179
LP11-EB	LP26 Unibus systems band printer; 600 lpm for 64-character set and 445 lpm for 96-character set (includes both)	14,400	150	179
LPV11-EP	LP26 Q-Bus systems band printer; 600 lpm for 64-character set	13,600	158	188
LPV11-FP	LP26 Q-Bus systems band printer; 600 lpm for 64-character set or 445 lpm for 96-character set	14,400	158	188
LPV11-E	LP26 Q-Bus upgrade option; 600 lpm for 64-character set; requires cabinet kit	13,550	158	188
LPV11-F	LP26 Q-Bus upgrade option; 600 lpm for 64-character set and 445 lpm for 96-character set; requires cabinet kit	14,350	158	188
LP27-UA(UB)	LP27 Unibus systems band printer; 1200 lpm for 64-character set or 800 lpm for 96-character set; includes 30-ft. (9.5-m) data cable and controller	29,990	259	308
LP27-DA(DB)	LP27 band printer with 50-ft. (15.2-m) data cable and long-line controller; with optional cables, allows operation up to 1,000 ft. (304.7 m) from host processor	32,990	310	369
LSP25-CA	LP25 Unibus line printer; U.S. PROM set, 300 lpm for 64-character set or 215 lpm for 96-character set, U.S./U.K. bands, power supply, and cable	9,990	119	142
LSP26-CA	LP26 Unibus line printer; U.S. PROM set, 300 lpm for 64-character set or 215 lpm for 96-character set, U.S./U.K. bands, power supply, and cable	15,600	172	205
LVP16-AA	Graphic pen plotter with documentation and initial supplies	1,995	10	12
LXY12-CA(CB)	LXY12 Unibus systems 300-lpm dot-matrix graphics printer with 30-ft. (9.2-m) cable, pedestal with basket, paper guide, and LP11 controller	11,250	104	124
LXY12-DA(DB)	LXY12 300-lpm dot-matrix graphics printer with cable for interfacing to RS-232-C serial port, pedestal with basket, and paper guide	11,250	104	124
LXY22-CA(CB)	LXY22 Unibus systems 600-lpm dot-matrix graphics printer with 30-ft. (9.2-m) cable, pedestal with basket, paper guide, and LP11 controller	15,800	135	161
LXY22-DA(DB)	LXY22 600-lpm dot-matrix printer with cable for interfacing to RS-232-C serial port, pedestal with basket, and paper guide	15,800	135	161
LCP01-AA	LCP01 ink-jet color printer with graphics processor	14,595	125	149

CABINETS AND EXPANSION HARDWARE

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
H9642-AP(AR)	Top-loading cabinet for RA60 removable disk; holds one RA60 in top bay and three RA60s, RA80s, and RA81s in any combination in middle and bottom bays	2,500	NC	NC
H9642-BD(BE)	Top-loading expansion cabinet for RL02 cartridge disk drive	1,570	NC	NC
H9642-EA(EB)	CPU cabinet includes I/O connection panel and accommodates 10.5- or 5.25-inch CPU, battery backup unit, stroage devices	2,200	NC	NC
H9642-FA(FB)	Partitioned expander cabinet; includes shielded cable duct and I/O connection panel; provides mounting space for a BA11-KU(KV) Unibus expander box and one of the storage devices applicable to H9642-EA(EB), above	2,200	NC	NC
H9642-FC(FD)	Unpartitioned expander cabinet for a BA11-KU(KV) Unibus expander box and two I/O connection panels; no disk or tape options can be mounted	2,050	NC	NC
H9645-EA(EB)	Wide CPU cabinet; provides mounting space for a 10.5-inch CPU and two storage devices	2,500	NC	NC
BA11-KU(KV)	Rackmount, 10.5-in. (26.6-cm) Unibus expansion box with slides for use in expander cabinets; includes cable for connection to CPU box and fans for front-to-back cooling; must be mounted in shielded enclosure	3,500	25	30
DD11-CK	Four-slot expansion backplane mounting unit for use in BA11-KU(KV) expander boxes; accommodates two hex and two quad slot modules	470	NC	NC
DD11-DK	Nine-slot expansion backplane mounting unit for use in BA11-KU(KV) expansion boxes; accommodates seven hex and two quad modules	940	NC	NC

NA—Not applicable.
NC—No charge.
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NOVEMBER 1986

DEC PDP-11 Family

	Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)

Q-Bus COMMUNICATIONS OPTIONS

Communications options are available either as factory-installed system options or as field-installable upgrade options. System options include the module, internal cables, and I/O connection panel inserts. For upgrade options, the customer must order the base option module and a cabinet kit containing the unique cable, filter assembly, and bracket hardware required to install the option in a specific cabinet. Several cabinet kits can be available for a given option, because different CPU cabinets require cables of different lengths and mounting brackets of different sizes.

Asynchronous Interfaces

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
DHV11	Eight-line asynchronous communications multiplexer; speeds to 38.4K bps			
DHV11-M	DHV11 upgrade option; includes base module only; requires an appropriate cabinet kit	1,520	15	18
DLVE1	Asynchronous, RS-232-C, one-line interface; dual-sized module; operating speeds from 50 to 19.2K bps			
DLVE1-M	DLVE1 upgrade option. Includes base module only; requires a cable kit	570	8	10
DLVJ1	Four-line EIA/CCITT asynchronous interface with limited modem control; line speeds from 150 to 38.4K bps			
DLVJ1-M	DLVJ1 upgrade option. Includes base module only; requires external cables and appropriate cable kit	760	12	14
DZQ11	Four-line asynchronous EIA/CCITT multiplexer; operating speeds to 9600 bps			
DZQ11-M	DZQ11 upgrade option. Includes base module only; requires external cables and appropriate cabinet kit	680	11	13

Synchronous Interfaces

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
DEQNA	DECnet option that connects Q-Bus systems to DECnet Ethernet local area network (LAN); requires transceiver cables and H4000 transceiver or DELNI to connect to Ethernet			
DEQNA-M	DEQNA upgrade option. Includes base module only; requires external cables and appropriate cabinet kit	1,975	15	18
DPV11	Single-line, program-controlled EIA/CCITT communications device; operating speeds to 56K bps			
DPV11-M	DPV11 upgrade option; requires an appropriate cabinet kit	575	14	17
DMV11	Intelligent microprocessor-based, single-line synchronous interface; operating speeds to 56K bps			
DMV11-M	DMV11 upgrade option; RS-232-C or RS-423/RS-449 interface; includes base module only; requires selection of external cables and appropriate cabinet kit	2,125	41	49
DMV11-N	DMV11 upgrade option; V.35 and integral modem interfaces; requires selection of external cables and an appropriate cabinet kit	1,800	41	49
KMV1A	Single-line, programmable controller with EIA RS-232-C/CCITT V.28, EIA RS-422/CCITT V.11, and EIA RS-423/CCITT V.10 interfaces; operating speeds to 64K bps			
KMV1A-M	KMV1A upgrade option; includes controller only; requires cabinet kit	2,210	29	35

UNIBUS COMMUNICATIONS OPTIONS

Communications options are available either as factory-installed system options or as field-installable upgrade options. System options include the module, internal cables, and I/O connection panel inserts. For upgrade options, the customer must order the base option module and a cabinet kit containing the unique cable, filter assembly, and bracket hardware required to install the option in a specific cabinet. Several cabinet kits can be available for a given option, because different CPU cabinets require cables of different lengths and mounting brackets of different sizes.

Single-Line Asynchronous Interfaces

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
DL11	DL11 single-line asynchronous interfaces provide local and remote inter-communication for Unibus systems and EIA/CCITT or 20 ma devices; operating speeds from 50 to 9600 bps			
DL11-M	DL11 upgrade option; RS-232-C interface and modem control. Includes base module only; requires external cables and an appropriate cabinet kit	925	8	10
DL11-N	DL11 upgrade option; RS-232-C and 20 ma interfaces without modem control; includes base module only; requires external cables and an appropriate cabinet kit	910	7	8

NA—Not applicable.
NC—No charge.
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DEC PDP-11 Family

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)

Multiline Interfaces

DH11	16-line asynchronous DMA multiplexers for local or remote connection of Unibus PDP-11s to EIA/CCITT terminals operating speeds up to 9600 bps			
DH11-M	DH11 upgrade option; RS-232-C interface with full modem control. Includes base module only; requires external cables and appropriate cabinet kit	7,240	71	85
DH11-N	DH11 upgrade option; RS-232-C interface without modem control. Includes base module only; requires external cables and appropriate cabinet kit	6,175	60	71
DHU11	Sixteen-line asynchronous multiplexer with direct memory access; connects Unibus systems to EIA/CCITT terminals; operating speeds up to 9600 bps			
DHU11-M	DHU11 system option; includes base module only; requires cabinet kit	3,420	45	54
DZ11	Eight-line asynchronous multiplexer; connects Unibus system to maximum of eight EIA/CCITT or 20 ma terminals; operating speeds up to 9600 bps			
DZ11-M	DZ11 upgrade option; RS-232-C interface. Includes base module only; requires external cables and an appropriate cabinet kit	2,440	35	42
DZ11-N	DZ11 upgrade option; 20 ma interface. Includes base module only; requires external cables and an appropriate cabinet kit	2,235	35	42

Point-to-Point Interfaces

DUP11	Single-line programmable synchronous interface between Unibus systems and systems with EIA RS-232-C/CCITT V.28 interface; operating speeds to 9600 bps			
DUP11-M	DUP11 upgrade option. Includes base module only; requires an appropriate cabinet kit	1,485	13	15
DMR11	DDCMP-based, microprocessor-controlled synchronous interface to connect Unibus systems to other systems with EIA/CCITT interfaces; operating speeds up to 1MB/second			
DMR11-M	DMR11 upgrade option. Includes base module only; requires an external cable and an appropriate cabinet kit	4,975	41	49
KMS11-BD	Programmable, eight-line synchronous interface; connects Unibus systems to systems with EIA/CCITT or MIL interfaces; operating speeds up to 56K bps; includes DD11-DK double system unit	12,500	102	121
KMS1P-M	KMS11-P; inlcudes microprocessor unit and line unit modules; requires a cable kit	5,710	80	95

Multipoint Synchronous Interfaces

DMP11	Single-line, microprocessor-controlled synchronous interface; connects Unibus systems to systems with EIA/CCITT interfaces; implements DDCMP; operating speeds to 1M bps			
DMP11-M	DMP11 upgrade option. Includes base module only; requires external cable and an appropriate cabinet kit	9,290	78	93

ETHERNET COMMUNICATIONS OPTIONS

H4000	H4000 Ethernet transceiver; provides functional interface between Ethernet coaxial cable and Ethernet station	325	4	5
H4005	Ethernet/IEEE 802.3 transceiver	300	4	5
DELNI-AA	Local Area Network Interconnect (LNI)	1,275	10	12
DEUNA-M	Synchronous communications controller; connects Unibus systems to a DECnet Ethernet LAN; operating speeds up to 10M bps	3,775	44	52
DELUA-M	Ethernet/IEEE 802.3-to-Unibus single-line controller; includes base module only; requires cabinet kit	3,275	33	39
DEREP-AA	Local Ethernet repeater; connects two coaxial cable segments no more than 328 feet (100 meters) apart	1,725	22	26
DEREP-RA	Remote Ethernet repeater (fiber optic); connects two coaxial cable segments up to 3,280 feet (1,000 meters) apart	5,075	44	52
DECSA-EA	One-line DECnet router server; includes one DCSAX-LA line card	13,500	152	181
DECSA-DA	DECnet router server unit and 16 DCSAX-LC cards	20,000	354	421
DCSAX-UA	Upgrade kit	4,750	95	113
DCSAX-LA	One-line synchronous EIA RS-232-C/CCITT V.24 line card for speeds up to 19.2K bps full-duplex	415	11	13
DCSAX-LB	One-line synchronous CCITT V.35 line card for speeds up to 500K bps full-duplex	650	11	13
DCSAX-LC	Two-line asynchronous EIA RS-232-C/CCITT line card for speeds up to 19.2K bps full-duplex	375	7	8
DECSK-AA	U.S. country kit for DECnet/SNA gateway (required); includes power cord, hardware documentation, and labels	25	NC	NC
DECOM-AA	Dual-cable U.S. broadband Ethernet transceiver	4,250	70	83
DECOM-BA	Single-cable U.S. broadband Ethernet transceiver	4,250	70	83
DEFTR-AA	U.S. broadband Ethernet frequency translator	4,500	42	50

DEC PDP-11 Family

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)

REALTIME I/O OPTIONS

I/O options are available either as factory-installed system options or as field-installable upgrade options. System options include the module, internal cables, and I/O connection panel inserts. For upgrade options, the customer must order the base option module and a cabinet kit containing the unique cable, filter assembly, and bracket hardware required to install the option in a specific cabinet. Several cabinet kits can be available for a given option, because different CPU cabinets require cables of different lengths and mounting brackets of different sizes.

Q-Bus Digital I/O Options

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
DRV11-LP	System option; general-purpose-program-controlled parallel line interface unit; permits program-controlled data transfers at rates up to 40K words per second; cables not included	370	6	7
DRV11	Upgrade option; includes only base option module; requires appropriate cabinet kit	300	6	7
DRV11-BP	System option; general-purpose Direct Memory Access (DMA) parallel line interface unit; permits data transfers at rates up to 250K words per second in single cycle mode and up to 500K words per second in burst mode; cables not included	740	9	11
DRV11-B	Upgrade option; includes only base option module; requires an appropriate cabinet kit	670	9	11
DRV11-JP	System option; general-purpose-program-controlled parallel line interface; contains 64 bidirectional input/output lines configured as four 16-bit ports; bit interruptible up to 16 lines; interrupt vectors may have fixed or rotating priorities; cables not included	520	9	11
DRV11-J	Upgrade option; includes only base option module. Requires an appropriate cabinet kit	450	9	11

Unibus Digital I/O Options

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
DR11-C	Upgrade option; includes only DR11 base option module	340	8	10
DR11-W	Upgrade option; includes only the DR11 base option module	1,350	14	17
DR11-WC	Long-line version of DR11-W general-purpose interface; provides for cable interconnection up to 1,000 feet; includes DR11-W plus differential adapter module, interconnect cables, test connectors for the adapter module, and an FCC-compliant I/O panel	3,295	42	50
DR11-WD	Long-line upgrade kit for DR11-W; includes all items in DR11-WC except DR11-W interface module	1,795	24	29
DRS11/DSS11	Digital I/O devices. DSS11 input module provides 48 optically isolated inputs with one interrupt input. DRS11 output module provides 48 buffered outputs with one interrupt. Unibus systems support up to 16 DRS11/DRSS11 units in any combination			
DRS11-A	Digital output device (TTL); includes one RC filtered interrupt input and two 19.6-ft. flat ribbon cables	2,145	23	27
DRS11-B	Digital output device with open collector drives; includes one RC filtered interrupt input and two 19.6-ft. flat ribbon cables	2,365	23	27
DSS11-A	Digital input device (TTL); includes two 19.6-ft. ribbon cables	2,670	21	25
DSS11-B	Digital input device; includes two 19.6-ft. ribbon cables	2,890	21	25

General-Purpose Q-Bus Interface

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
IEQ11-AB	Bit parallel, byte-serial DMA Q-bus interface controller for IEEE-488-1978 instruments; includes module, test cable, and bulkhead/cable assembly	1,950	25	30

General-Purpose Unibus Interface

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
IEU11-AB	Bit parallel, byte-serial DMA Unibus interface controller for IEEE-480-1978 instruments; includes module, test cable, and bulkhead/cable assembly	2,915	25	30

Realtime Clocks

		Purchase Price ($)	Basic Service (Monthly) ($)	DEC Service (Monthly) ($)
KW11-P	Unibus programmable realtime clock	880	11	13
KWV11-C	Q-Bus 16-bit programmable realtime clock	895	25	30

NA—Not applicable.
NC—No charge.
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DEC PDP-11 Family

SOFTWARE PRICES

		License Fee* ($)
OPERATING SYSTEMS		
QJ821-UZ	DSM-11	3,000
QJB51-UZ	Micro/RSX	**800
QR430-UZ	RSTS/E	3,000
QR500-UZ	RSX-11M-Plus	3,000
QJ642-UZ	RSX-11S	1,000
QJ085-HZ	Ultrix-11; for 16 users on MicroPDP-11 systems only	420
QJ087-UZ	Ultrix-11; maximum 16 users	800
QJ088-UZ	Ultrix-11; maximum 32 users	1,600
LANGUAGES		
QJ916-UZ	Basic-Plus-2 for RSTS/E	3,000
QY809-UZ	Basic-Plus-2 for Micro/RSTS	1,200
QJ918-UZ	Basic-Plus-2 for RSX-11M/-11M-Plus	3,000
QY805-UZ	Basic-Plus-2 for Micro/RSX	1,200
QJ913-UZ	Basic/RT-11	990
QJ993-UZ	Cobol-81 for RSTS/E	3,000
QJ994-UZ	Cobol-81 for RSX-11M/-11M-Plus	3,000
QY802-UZ	Cobol-81 for Micro/RSX	1,200
QP066-UZ	Cobol-66 for RSX-11M only	4,050
QP528-UZ	Dibol-83 for RSTS/E	3,000
QP540-UZ	Dibol-83 for RSX-11M/-11M-Plus	3,000
QY807-UZ	Dibol-83 for Micro/RSX	1,200
QJ813-UZ	Fortran-IV for RT-11	640
QR435-UZ	Fortran-IV for RSTS/E	700
QP230-UZ	Fortran-IV for RSX-11M/-11M-Plus	700
QR100-UZ	Fortran-77 for RSTS/E	3,000
QY810-UZ	Fortran-77 for Micro/RSTS	1,200
QJ668-UZ	Fortran-77 for RSX-11M/-11M-Plus, and RSX-11S	3,000
QY803-UZ	Fortran-77 for Micro/RSX	1,200
QY811-UZ	Fortran-77 Debug for Micro/RSTS	300
QJ128-UZ	Pascal/RSX for RSX-11M/-11M-Plus	3,000
QY806-UZ	Pascal/RSX for Micro/RSX	1,200

*Single-use license and warranty.
**PDP-11 Operating System General License; includes license, warranty, and one-time right to copy. ∎