

Digital Equipment Corp.: PDP-11 Series

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Product Summary

Editor's Note

Since our last report, Digital Equipment Corp. has announced the MicroPDP-11/93 supermicrocomputer and the PDP-11/94 minicomputer even though the 16-bit series has surrendered its strategic importance to the more powerful, 32-bit MicroVAX and VAX Series. Because of Digital's commitment to the PDP-11, Datapro continues to present current systems and prices.

Description

The PDP-11 supports a broad range of commercial, scientific, and industrial applications. The five supermicrocomputer and two minicomputer models are compatible across the product line.

Strengths

Digital's new models offer high-speed data transfers and enhanced system performance. PDP-11 peripherals and applications can be used on VAX systems for cost-effective upward migration.

Limitations

In-family migration to a more powerful CPU requires a processor swap. No system can be field upgraded. Off-board memory is not supported on the MicroPDP-11/93 or the PDP-11/94.

Competition

NCR, IBM, Hewlett-Packard, and Bull.

Vendor

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Price

\$9,156 to \$21,420.

GSA Schedule

Yes.

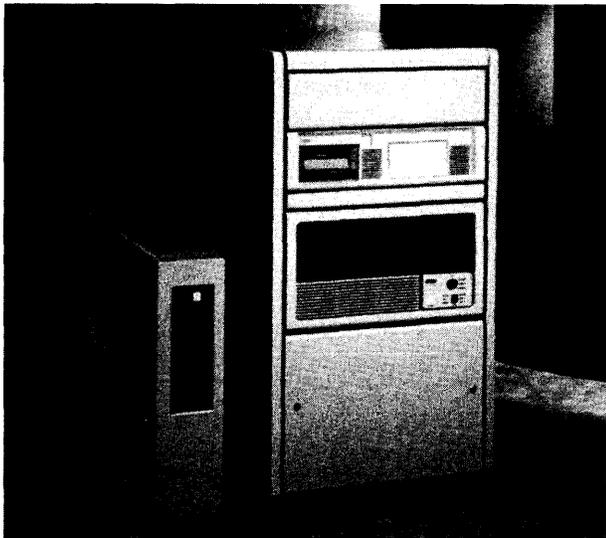
—By *Marlene H. Schulke*
Associate Editor/Analyst

Analysis

Product Strategy

Digital continues to devote marketing and technical resources to the PDP-11 Family. The 16-bit series, however, has almost reached its architectural limits. Even though Digital promises to support the PDP-11 through the 1990s, its market appeal is now greatly limited. In fact, the PDP-11 has surrendered its strategic importance to the more powerful, 32-bit MicroVAX and VAX Series systems—Digital's flagship product lines. New sales opportunities for business systems, manufacturing applications, and industrial automation are met with the MicroVAX and VAX Series. Digital also upgrades PDP-11 users to MicroVAX- and VAX-based systems. Several available tools simplify the migration from a PDP-11 to a MicroVAX or VAX system.

A significant installed base of over 400,000 PDP-11 models exists. These systems are targeted



The MicroPDP-11/93 and PDP-11/94 (shown here) are based on a common high-performance CPU processor that extends the performance of the CMOS J-11 chip set and the integral FPJ11 floating point co-processor.

for a broad range of applications in both commercial, scientific, and industrial environments. Currently, Digital only sells PDP-11s to customers with a strong desire to remain with the PDP-11 architecture. Such customers have substantial investments in PDP-11 applications and resources; they do not want to incur the disruptions involved in changing system platforms.

Applications

Numerous application software packages are available to PDP-11 users due to the series' language and file structure compatibility across most operating systems. This allows software to be transported across systems without alteration. PDP-11 programs can also run on most VAX systems in compatibility mode. Digital offers several data management, program development, and graphics applications for PDP-11 systems. Transaction teleprocessing, timesharing, and batch processing environments are supported. In addition, over 2,000 third-party applications are available for the systems.

Competitive Position

The PDP-11 family competes within the general-purpose, minicomputer, and supermicrocomputer market. In the general environment, Digital positions the PDP-11 Series against the NCR 3000 Series, the IBM AS/400, Hewlett-Packard's HP MICRO 3000 Series, and Bull's DPS 6000 line.

In addition to competing with the vendors mentioned above for sales within the medium-sized system marketplace, Digital is competing from within. Sales of PDP-11 systems will be limited to those dedicated to its proprietary architecture, while those requiring enhanced system performance will turn to the MicroVAX or VAX series. Cost-effective upward migration to MicroVAX or VAX systems from PDP-11s will decrease its market share.

Decision Points

Strengths

The first PDP-11 systems were delivered 20 years ago. Digital recently expanded the product line, which previously comprised four supermicros and

Table 1. System Comparison

Model	MicroPDP-11/53	MicroPDP-11/53 Plus	MicroPDP-11/73 Plus	MicroPDP-11/83 Plus
System Characteristics				
Date Announced	6/83	6/83	9/84	11/85
Date First Installed	7/84	9/84	9/84	12/85
Operating system	RSX-11M-Plus; RSX-11M; RSX-11S; Micro/RSX; RSTS/E; Micro/RSTS; RT-11; CTS-300; MicroPower Pascal; DSM-11	RSX-11M-Plus; RSX-11M; RSX-11S; Micro/RSX; RSTS/E; Micro/RSTS; RT-11; RT-11; CTS-300; MicroPower Pascal; DSM-11	RSX-11M-Plus; RSX-11M; RSX-11S; Micro/RSX; RSTS/E; Micro/RSTS; RT-11; CTS-300; MicroPower Pascal; DSM-11	RSX-11M-Plus; RSX-11M; RSX-11S; Micro/RSX; RSTS/E; Micro/RSTS; RT-11; CTS-300; MicroPower Pascal; DSM-11
Min/Max Memory (bytes)	512K/4M	1.5M/4M	1M/4M	2M/4M
Expansion Increments (bytes)	512K, 1M	512K, 1M	1M	1M
Min/Max Storage (bytes)	20M/300M	42M/402M	71M/1.38G	159M/1.8G
Number of Processors	1	1	1	1
Number of Terminals	26	26	41	65
Registers/Address Modes	9/8	9/8	12/8	9/8
Central Processing Unit & Memory				
Computer Type	16M-bit	16M-bit	16M-bit	16M-bit
Processor Model	Proprietary (J-11)	Proprietary (J-11)	Proprietary (J-11) (1)	Proprietary (J-11) (1)
CPU Cycle Time (MHz)	15	15	15	18
Memory Type	Parity MOS	Parity MOS	Parity MOS	ECC MOS
Cache Memory (bytes)	0	0	8K	8K
ROM (bytes) (2)	32K/2K	32K/2K	32K/2K	32K/2K
Basic Configuration				
Memory/Storage Included (bytes)	512K/20M	1.5M/71M	1M/71M	2M/159M
Purchase Price (\$)	9,156	18,375	20,595	28,529

(1) Can optionally be configured with the DCJ-11, which implements full PDP-11 instruction set and offers faster processing.

(2) Bootstrap/diagnostic ROM; electrically erasable ROM.

one minicomputer, to include the MicroPDP-11/93 supermicrocomputer and the PDP-11/94 minicomputer. Both have Private Memory Interconnect (PMI) architecture which offers high-speed data transfers and enhanced system performance. These new models verify Digital's commitment to the PDP-11 family. In addition to the high performance MicroPDP-11/93 and the PDP-11/94, the series offers a wide range of system performance and pricing to suit the requirements of most general-purpose computer users.

Another advantage of the PDP-11 family is that its peripherals can be used on VAX systems for cost-effective upward migration should the performance of those families become required. In the software applications area, PDP-11 programs can run on most VAX systems in compatibility mode. A large software library is available to PDP-11 users. The PDP-11 languages and file structure are compatible across most of the operating systems allowing software to be transported across systems without alteration. All PDP-11s support DECnet

software. This allows the systems to be connected into Digital's local- and wide-area networks.

Communications

Digital offers a number of software products both for communications among its own machines and for access to networks that include other vendors' systems. Communications with other Digital computer systems and networks are handled through DECnet, a family of Phase IV network products that allows a suitably configured PDP-11 computer system to participate as a routing or nonrouting (end) node in a network with other Digital systems. One of the most significant PDP-11 advantages is its communications and networking scheme. Supporting DECnet software enables it to tie into Digital local- and wide-area networks.

Limitations

In-family migration to a more powerful CPU requires a processor swap since no system can be field upgraded to the next highest. Another restriction is that off-board memory is not supported on

Company Profile Digital Equipment Corp.

Corporate Headquarters

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Officers

President: Kenneth H. Olsen
Senior Vice President, Engineering, Manufacturing, and Product Marketing: John F. Smith
President and CEO, European Operations: Pier Carlo Falotti

Company Background

Year Founded: 1957
No. Employees: 125,000

Led by Kenneth H. Olsen, three engineers founded Digital Equipment Corporation in 1957. Using their own money in addition to funding from a Boston venture-capital firm, they set up operations in an old brick wool mill in Maynard, MA.

Digital's first product was a set of electronic modules for computer test equipment. Three years after its founding, Digital introduced its first computer, the Programmed Data Processor Model 1, or PDP-1. In 1963, the company introduced its

landmark PDP-8, the first successful minicomputer.

The PDP-8 established a whole new market for smaller computers and made Digital a rising star within an industry then dominated by mainframe vendors. Digital's smaller machines soon became a price/performance alternative to big mainframes and also introduced the concept of distributed processing.

In 1977, Digital introduced the VAX (virtual address extension) Series of 32-bit minicomputers, one of the most successful product launches in computer industry history. Since introducing the first VAX, the 11-780, Digital has continued to enhance the basic VAX architecture and VAX/VMS operating system with announcements of new and more

powerful VAX models over the years.

To support its systems, Digital offers disk, storage array, and solidstate memory products; optical disks; tape devices; and printers. Besides hardware and software, Digital offers a range of communications and networking products and services.

Business Overview

Digital likes to characterize itself as the world's leading supplier of networked computer systems as well as a leader in systems integration. To remain a leader, particularly in these specific areas, the company believes it must support openness and industry standards to remain competitive in the 1990s. The company is a key participant in industry standards organizations such as the

the MicroPDP-11/93 or the PDP-11/94; the maximum memory is 2M bytes or 4M bytes.

This 16-bit series has almost reached its architectural limits; therefore, its market appeal is now greatly limited.

Future Directions

Digital continues to provide marketing and technical support for the series, and promises to do so throughout the 1990s. Although business, manufacturing, and industrial automation application needs are met with the MicroVAX and VAX Series, PDP-11 users find the proprietary architecture and vast software library more than suit their requirements. Compatibility between programs and peripherals, and easy upgradability will continue to attract commercial and industrial users.

Characteristics

System Overview

See Table 1 for a comparison of the system characteristics, including main memory and processing components.

Specifications

The PDP-11 data formats include a 16-bit word plus two parity bits as a basic unit. The processor can also handle eight-bit bytes and is capable of bit manipulation.

Open Systems Foundation (OSF), an industry group founded in 1988 to develop industry recognized specifications for UNIX. UNIX will be the standard operating system for users who prefer open systems rather than proprietary systems.

Network Application Support (NAS), a new Digital strategic direction addressing VAX compatibility and multivendor connectivity, will let users integrate desktop systems and large system resources involving both Digital and non-Digital systems.

In 1988, Digital introduced Enterprise Management Architecture (EMA), an integrated network management strategy.

Financial Profile

Digital continues to rank as the second largest

U.S. computer company as measured by total revenues. While Digital enjoyed record revenue and profit growth through the 1980s—largely on the strength of its VAX platform and networking architecture—sales and profits have been sluggish within the last couple of years.

It is evident from the company's report of an 80 percent drop in earnings for the first quarter of 1991 that Digital continues to undergo pain. For the first quarter of fiscal 1991, ended September 30, 1990, Digital reported revenue of \$3.09 billion, down 1.2 percent from \$3.13 billion for the same period last year. Net income was \$26.18 million, a staggering 82.6 percent drop from \$150.78 million in the year-ago period.

Digital blamed the profit drop on an economy that is teetering on the brink of a recession and lower demand for high-margin products. Like major competitors, Digital continues to do better internationally.

Second-quarter 1991, ended December 29, 1990, reported revenues of \$3.35 billion, up five percent from second-quarter 1990. Net income was \$111.2 million. According to Digital, the company began to see the benefits of investments, cost-control efforts, and an improved revenue growth.

In moves designed to reduce expenses, last summer Digital announced that it would begin shifting 4,000 manufacturing employees to other jobs and

offered severance packages to 700 manufacturing and administrative employees.

Management Statement

Digital is making a \$1.5 billion dollar investment toward new product development. According to the president's letter, Digital is "continuing to invest heavily in VAX and RISC-based systems and VMS and UNIX software." Within the next year, "Digital's strategy is to focus on the computing environment of the 1990s. Digital will offer the widest selection of technology and continue to make significant investments in R&D and new products in response to dynamically changing customer needs."

Its fixed point operands range between six-bit words or eight-bit bytes, and are used as operands in both single- and double-operand instructions. Bit manipulation is provided through Boolean AND/OR instructions.

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

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

Internal Code is ASCII for text-oriented data; binary for calculations.

Peripherals

See Tables 2, 3, 4, and 5 for information on Mass Storage Devices, Workstations, Printers, and Magnetic Tape Equipment, respectively.

Configuration Rules

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

System Building Blocks (SBBs) include the CPU, base memory, and cabinetry. They require a selection from the integrated mass storage device and base system software menus. Selections from the diagnostics/documentation, additional memory, terminal/printer (for

Table 1. System Comparison (Continued)

Model	MicroPDP-11/93	PDP-11/84 Plus	PDP-11/94
System Characteristics			
Date Announced	5/90	4/85	5/90
Date First Installed	5/90	5/85	5/90
Operating system	RSX-11M-Plus; RSX-11M; RSX-11S; Micro/RSX; RSTS/E; Micro/RSTS; RT-11; CTS-300; MicroPower/Pascal; DSM-11	RSX-11M-Plus; RSX-11M; RSX-11S; Micro/RSX; RSTS/E; Micro/RSTS; RT-11; CTS-300; MicroPower/Pascal; DSM-11	RSX-11M-Plus; RSX-11M; RSX-11S; Micro/RSX; RSTS/E; Micro/RSTS; RT-11; CTS-300; MicroPower/Pascal; DSM-11
Min/Max Memory (bytes)	2M/4M	2M/4M	2M/4M
Expansion Increments (bytes)	2M	2M	2M
Min/Max Storage (bytes)	71M/622M	456M/4.8G	205M/1.2G
Number of Processors	1	1	1
Number of Terminals	65	80	80
Registers/Address Modes	9/8	12/8	9/8
Central Processing Unit & Memory			
Computer Type	16M-bit	16M-bit	16M-bit
Processor Model	Proprietary (J-11)	Proprietary (J-11)	Proprietary (J-11)
CPU Cycle Time (MHz)	18	18	18
Memory Type	Parity MOS	ECC MOS	Parity MOS
Cache Memory (bytes)	0	8K	0
ROM (bytes) (1)	—	32K	—
Basic Configuration			
Memory/Storage Included (bytes)	2M or 4M/159M	2M/456M	2M or 4M/205M
Purchase Price (\$)	14,175	29,106	21,420

(1) Bootstrap/diagnostic ROM.

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

at least a console device), communications/networking, and hardware/software maintenance services menus are optional.

Standard Systems, based on SBBs, include basic mass storage devices. The purchaser must make a selection from the base system software menu. Selections from the diagnostics/documentation, additional memory, additional mass storage, terminal/printer, communications/networking, and hardware/software maintenance services menus are optional.

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

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

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

The BA213, which also offers 12 slots, accommodates one TK50 tape drive and up to three RD54 or RD53 fixed disk drives. Two BA23 enclosures configurable in the 14-slot H9642 cabinet package can accommodate a total of four 5.25-inch storage devices, including up to two RD54 or RD53 disk drives and up to two RX50 diskettes or TK50 tapes. Up to four RX33s can be accommodated, depending upon the other devices in the configuration. The H9642 cabinet also provides space for two 10.5-inch storage devices, including the 205M-byte RA60 removable and 456M-byte RA81 fixed disks and the 40M-byte TS05 tape drive.

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

The PDP-11/93 is available in pedestal, tabletop, and rackmount models. PDP-11/94 is available in rackmount and cabinet-based system building block units. The MicroPDP-11/93 BA23 pedestal and rackmount packages can accommodate one RS54 or RD53 fixed disk, or up to two RD31 half-height disks, and up to two RX33 half-height diskettes or one TK50 tape drive. PDP-11/94 Kernel configurations consist of 2M bytes or 4M bytes of memory, eight serial lines, and a nine-slot backplane. Two DD11-DK backplanes can be added for

Table 2. Mass Storage Devices

Model	RD31A-AA	RX33-A	RD53-DA	RD54-DA
Type	Winchester	Diskette	Winchester	Winchester
Formatted Capacity (bytes)	20M	1.2M	71M	159M
Interface/Controller	RQDX3 RD/RX Disk Controller	RQDX3 RD/RX Disk Controller	RQDX3 RD/RX Disk Controller	RQDX3 RD/RX Disk Controller
Data Transfer Rate (bytes/sec)	625K	500K	5M	5M
Purchase Price (\$)	1,413	396	4,410	5,890

Table 2. Mass Storage Devices (Continued)

Model	RA90	SA600	SA705
Type	Winchester	Storage Array	Storage Array
Formatted Capacity (bytes)	1.2G	1.2/2.4/4.8/9.7G	1.1/4.4G
Interface/Controller	KDA50-QA RA-Series Disk Controller	HSCXX or RA-Series Disk Controllers	HSCXX or RA-Series Disk Controllers
Drives per Subsystem/Controller	4/6	1/2/4/8	4/8
Purchase Price (\$)	27,500	27,500, 51,500, 99,000, 109,000	62,000/200,000

Also supported: 205M-byte RA60 Winchester, 280M-byte RA70 Winchester, 622M-byte RA82 Winchester, SA482 and SA550 Storage Arrays ranging between 1.1 to 2.4G bytes.

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

Table 3. Workstations

Model	VT 320	VT 330	VT 340	VT 420	VT 1000 (1)	VT 1200
Tilt/Swivel Screen Character Phosphor	Standard White, green, or amber	Standard White on black	Standard Color	Standard White, green, or amber	Standard White, green, or amber	Standard White, green, or amber
Printer Interface	Yes	Yes	Yes	Yes	Yes	Yes
Purchase Price (\$) (2)	572	1,795	2,595	629	2,695, 3,995, 13,995	2,695, 3,995, 13,995

(1) X Windows Terminal.

(2) Includes List Warranty.

additional expansion. The rackmount PDP-11 supports 27 slots through expansion.

Input/Output Control

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

I/O control on the PDP-11/84 Plus and -11/94 are handled through the *UNIBUS*, a bidirectional, asynchronous interconnect providing a single common data path that treats all components—processor, memory modules, and peripheral controllers—as equal-level devices

for data accesses and transfers. The priority of any device connected to the *UNIBUS* is determined by its physical position; the processor is normally attached to give it the highest priority.

Communications

Communications Control

The RSX-11 and Micro/R SX 2870/3780 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. They provide facilities for both program-to-program interactive communications and data pass-through 3270 terminal emulation. Terminal users and application programs can

Table 4. Printers

Model	LN03	LN05	LN06	2100	2200
Type	Laser	Laser	Laser	Laser	Laser
Speed	8 ppm	8 ppm	8 ppm	8 ppm	8 ppm
Character Set	ANSI/Post-script	ANSI	ANSI	ANSI	ANSI
Purchase Price (\$)	3,040	2,695	3,999	2,395	3,595

Table 4. Printers (Continued)

Model	LJ250	LJ252	LP37	LP29	LG01
Type	Ink-Jet	Ink-Jet	Band	Band	Line
Speed	167 cps	167 cps	1,200 lpm	2,000 lpm	600 lpm
Purchase Price (\$)	1,549	1,549	23,625	36,645	8,390

Table 4. Printers (Continued)

Model	LA324	LA70	LA75	LA210
Type	Dot Matrix	Dot Matrix	Dot Matrix	Dot Matrix
Speed	100/300 cps	40/100/200 cps	32/42/125/250 cps	40/80/240 cps
Purchase Price (\$)	1,995	499	835	1,675

Note: 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.

exchange data with a program running under IMS/VS, CICS/VS, or TSO on an IBM 370 host.

A number of asynchronous, synchronous, and Ethernet communications devices are available for both Q-bus and UNIBUS PDP-11 systems. Local or remote interconnections 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 are possible. An Ethernet-to-Q-bus synchronous communications controller connects Q-bus systems to Ethernet local area networks. It operates at 10M bps and is supported under DECnet Phase IV software. Systems can communicate with up to 1,023 addressable devices on an Ethernet LAN.

A synchronous communications controller connects UNIBUS PDP-11 systems to Ethernet V2.0 and IEEE 802.3 LANs. This microprocessor-based controller operates at 10M bps and provides 4M bps throughput. The H4000 Ethernet Transceiver is a device that provides the functional interface between Ethernet coaxial cable and Ethernet nodes. The H4000 station transmits signals onto and receives signals from the cable and detects any message collisions that occur. The H4000 uses a tapping mechanism for physical connection to the cable.

A DMA single-line programmable communications controller provides interconnections 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, and can be programmed in synchronous or asynchronous mode. On a

MicroPDP-11 system, it performs user-defined communications functions, freeing the CPU for applications processing. The KMV1A supports Digital's VAX Packetnet System Interface (PSI) software at speeds up to 19.2K bps. These products are available for the RSX-11S, RSX-11M, and RSX-11M-Plus operating environments.

Protocols Supported: Async, sync, IEEE-488, TTL, SNA, 3270, 2780/3780, DNA, HASP, X.25.

LANs Supported: Ethernet.

Software

Operating Systems

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

Database Management Systems

PDP-11 systems do not employ separate database management systems. Data and file management facilities are built into most of the operating systems. Several information management applications are available for the PDP-11 Family.

Table 5. Magnetic Tape Equipment

Model	TK50-AA/DA	TSV05-AA	TU81E-AA
Type	Cartridge	Streaming	Tape Subsystem
Storage Capacity (bytes)	95M	40M	40M/145M
Streaming Technology	Yes	Yes	Yes
Purchase Price (\$)	3,306/4,015	10,299	34,755

Languages

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

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

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

Communications

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

Communications with other Digital computer systems and networks are handled through DECnet, a family of Phase IV network products that allows a suitably configured PDP-11 computer system to participate as a routing or nonrouting (end) mode in a network with other Digital systems.

Pricing and Support**Pricing**

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

Support

Each PDP-11 system includes a one-year on-site hardware warranty. Software products have a 90-day limited warranty. Digital offers a wide variety of hardware and software services for the PDP-11s and other systems.

Digital maintains training centers worldwide.

Courses covering both Digital equipment-related and nonproduct-related topics are offered. Digital's Educational Services division publishes a digest listing available courses four times a year.

Prices for specific popular configurations and applicable monthly maintenance follow.

Equipment Prices

		Purchase Price (\$)	Basic Service (Mo.) (\$)	DEC Service (Mo.) (\$)
MicroPDP-11/53 Systems				
DH-153Q1-A2	MicroPDP-11/53 floor/table system; includes CPU, 512K-byte on-board memory, 20M-byte RD31 disk, RQDX3 disk controller, 1.2M-byte RX33 diskette, two async lines, BA23 enclosure, documentation and diagnostics; 120 V system	9,156	85	101
DH-153Q1-AA	Same as DH-153Q1-A2, but 240 V system	9,471	85	101
DH-153Q5-AA	Same as DH-153Q1-A2, but rackmount	8,999	95	113
DH-153Q5-A3	Same as DH-153Q1-A2, but rackmount, 240 V system	9,314	95	113
MicroPDP-11/53 Plus Systems				
DH-153Q3-B2	MicroPDP-11/53 Plus floor/table system; includes 1.5M bytes of on-board memory, 71M-byte RD53 disk drive, RQDX3 disk controller, TK50 95M-byte tape drive and controller, two async lines, DHQ11 8-line serial interface, BA23 enclosure, 120 V system	18,375	150	179
DH-153Q3-BA	Same as DH-153Q3-B2, but 240 V system with documentation and diagnostics	18,690	150	179
DH-153Q4-B2	Same as DH-153Q3-B2, but rackmount	18,218	117	139
DH-153QD-B3	Same as DH-153Q3-B2, but rackmount 240 V system with documentation and diagnostics	18,533	117	139
MicroPDP-11/73 Plus Systems				
DH-173Q1-C2	MicroPDP-11/73 floor/table system; includes CPU, 1M-byte parity MOS memory, 71M-byte RD53 disk drive, RQDX3 disk controller, 95M-byte TK50 tape drive and controller, one async line, DHQ11 8-line multiplexer, BA23 enclosure, 120 V power cord	20,595	179	213
DH-173Q1-CA	Same as DH-173Q1-C2, but 240 V system with documentation and diagnostics	20,937	179	213
173QY-C2	MicroPDP-11/73 BA23 System Building Block (SBB); includes CPU, 1M-byte memory, asynchronous console serial line, serial line cable, BA23 floor/tabletop enclosure, and 120 V power cord	12,283	90	107
173QY-D2	MicroPDP-11/73 BA23 SBB; includes 2M-byte memory, asynchronous console serial line, serial line cable, BA23 floor/tabletop enclosure, and 120 V power cord	12,700	90	107
173QB-C2	MicroPDP-11/73 BA123 SBB; includes CPU, 1M-byte memory, BA123 floorstanding enclosure, and 120 V power cord	16,057	100	119
173QZ-C2	Same as 173QB-C2, but rackmount	12,098	90	107
173QZ-D2	Same as 173QZ-C2, but with 2M-byte memory	12,525	90	107
MicroPDP-11/83 Plus Systems				
DH-183Q1-B2	MicroPDP-11/83 BA23 floor/table system; includes CPU with floating-point accelerator (FPA), 2M-byte memory, 159M-byte RD54 disk drive, RQDX3 disk controller, 95M-byte TK50 tape drive and controller, one async line, serial line unit for console terminal, DHQ11 8-line multiplexer, BA23 enclosure, 120 V power cord	28,529	207	246
DH-183Q1-BA	Same as DH-183Q1-B2, except 240 V system with documentation and diagnostics	28,875	207	246
DH-183Q2-CA	MicroPDP-11/83 BA123 floorstanding system; includes CPU with FPA, 2M-byte memory, 159M-byte RD54 disk drive, RQDX3 disk controller, 95M-byte TK50 tape drive and controller, two DHQ11 8-line multiplexers, BA123 enclosure, 240 V power cord, documentation, and diagnostics	36,498	232	276
DH-183Q3-CA	MicroPDP-11/83 H9642 cabinet system; includes CPU with FPA, 2M-byte memory, 622M-byte RA82 disk drive, KDA50 disk controller, 95M-byte TK50 tape drive and controller, two DHQ11 8-line multiplexers, H9642 cabinet with dual BA23 boxes, 240 V power cord, documentation, and diagnostics	57,866	304	362
183QY-D2	MicroPDP-11/83 BA23 System Building Block (SBB); includes CPU, 2M-byte memory, asynchronous console serial line, serial line cable, BA23 floor/ tabletop enclosure, and 120 V power cord	15,593	83	99
183QB-D2	MicroPDP-11/83 BA123 SBB; includes CPU with FPA, 2M-byte memory, BA123 floorstanding enclosure, and 120 V power cord	19,681	93	111
183QE-D2	MicroPDP-11/83 H9642 cabinet SBB; includes CPU with FPA, 2M-byte memory, asynchronous console serial line, serial line cable, H9642 cabinet with dual BA23 boxes, and 120 V power cord	25,641	99	118

		Purchase Price (\$)	Basic Service (Mo.) (\$)	DEC Service (Mo.) (\$)
PDP-11/84 Plus Systems				
SX-JX200-EC	PDP-11/84 H9642 System Building Block (SBB); includes CPU, co-processor, 2M-byte memory, H9642 cabinet, and choice of RSTS/E, RSX-11M or -11M-Plus, or DSM-11 operating system license	29,106	151	180
SX-JX200-EE	Same as SX-JX200-EC, but with 4M-byte memory	31,416	183	218
SX-JX300-EC	PDP-11/84 H9645 wide-body SBB; includes CPU, 2M-byte memory, H9645 cabinet, and choice of RSTS/E, RSX-11M or 11M-Plus, or DSM-11 operating system license	29,453	151	180
SX-JX300-EE	Same as SX-JX300-EC, but with 4M-byte memory	31,763	183	218
SX-JX400-EC	PDP-11/84 H9647 four-high SBB; includes CPU, 2M-byte memory, H9647 cabinet, and choice of RSTS/E, RSX-11M or -11M-Plus, or DSM-11 operating system license	30,608	151	180
SX-JX400-EE	Same as SX-JX400-EC, but with 4M-byte memory	32,918	183	218
MicroPDP-11/93 Systems				
193QY-D2	MicroPDP-11/93 BA23A-AF floor/table System Building Block; includes CPU, co-processor, 2M-byte memory, eight buffered serial lines, 120 V power cord	14,175	126	150
193QY-D3	Same as 193QY-D2, but 240 V system without power cord	14,175	126	150
193QY-E2	Same as 193QY-D2, but 4M-byte memory	16,275	162	193
193QY-E3	Same as 193QY-D2, but 240 V system without power cord	16,275	162	193
193QZ-D2	Same as 193QY-D2, but rackmount	14,175	126	150
193QZ-D3	Same as 193QZ-D2, but 240 V system without power cord	14,175	126	150
193QZ-E2	Same as 193QZ-D2, but 4M bytes of memory	16,275	162	193
193QZ-E3	Same as 193QZ-E2, but 240 V system without power cord	16,275	162	193
PDP-11/94 Systems				
11/94-EC	11/94 10.5-inch rackmount box System Building Block, includes KDJ11-EA CPU, co-processor, 2M bytes of memory, eight buffered serial lines, CK-KDJ1E-KB Unibus cab I/O, bulkhead kit for 8 serial lines, KTJ11-B Unibus adapter, M9713-AA Minimum Load Module, M9714-AA Alternate Power Module, 120 V Power Supply	21,420	184	219
11/94 EE	Same as 11/94-EC with 4M bytes of memory	23,520	220	262
11W94-EC	11/94 42-inch cab System Building Block, includes 11/94-ED 10.5-inch box, 2M bytes of memory, H9645-EA 42-inch widebody system cab with 120 V power controller	25,148	184	219
11W94-EE	Same as 11W94-EC, but with 4M bytes of memory	27,248	220	262
11X94 EC	Same as 11W94-EC without widebody system cab	24,833	184	219
11X94-EE	Same as 11W94-EE without widebody system cab	26,933	220	262

Software Prices

**Basic
License
Charge
(\$)**

Prices shown are list prices. Class H licenses are for PDP-11/84 Plus, MicroPDP-11/93, and PDP-11/94 systems. Class L licenses are for MicroPDP-11/53, MicroPDP-11/53 Plus, MicroPDP-11/73 Plus, MicroPDP-11/83 Plus, and older PDP-11 systems.

Operating Systems:

QJ013-UZ	RT-11 Class H with warranty	1,710
QJ628-UZ	RSX-11M Class H with warranty	3,890
QJ642-UZ	RSX-11S Class H with warranty	1,430
QR430-UZ	RSTS/E Class H with warranty	4,280
QR500-UZ	RSX-11M Class H with warranty	3,890
QY013-UZ	RT-11 Class L with warranty	855
QY430-UZ	RSTS/E Class L with warranty	1,850
QY505-UZ	RSX-11M-Plus Class L with warranty	1,850
QY628-UZ	RSX-11M Class L with warranty	1,850
QY642-UZ	RSX-11S Class L with warranty	1,140
QY800-UZ	Micro/RSX Class L with warranty	1,280
QJ821-UZ	DSM-11 Class H with warranty	4,280
QJ354-UZ	CTS-300 Class H with warranty	2,592
QY354-UZ	CTS-300 Class L with warranty	1,037
QY821-UZ	DSM-11 Class L with warranty	1,850

Languages:

QJ913-UZ	Basic-Plus/RT11 Class H	1,410
QY913-UZ	Basic-Plus/RT11 Class L	840
QY918-UZ	Basic-Plus 2 for RSX-11M/Plus	1,710
QJ918-UZ	Basic-Plus 2 Class H for RSX-11M Plus	4,280
QY916-UZ	Basic-Plus 2 Class L for RSTS/E	1,710
QJ916-UZ	Basic-Plus 2 Class H for RSTS/E	4,280
QY805-UZ	Micro/RSX Basic Plus 2 Class L	1,710
QJ813-UZ	Fortran IV/RT-11 Class H	1,710
QY813-UZ	Fortran IV/RT-11 Class L	1,000
QY668-UZ	Fortran-77/RSX Class L	1,710
QJ668-UZ	Fortran-77/RSX Class H	4,280
QY803-UZ	Micro/RSX Fortran-77 Class L	1,710

Communications:

QJ763-UZ	DECnet 11S Class H	2,830
QJ764-UZ	DECnet 11M Class H	8,890
QJ766-UZ	DECnet 11M+ Class H	7,880
QP692-UZ	DECnet/E Class H	4,990
QY692-UZ	DECnet/E Class L	1,570
QY766-UZ	DECnet-Micro/RSX Class L	2,140

Applications:

QJ715-UZ	FMS-11/RSX Class H	2,000
QP301-UZ	Datatrieve/11M(+) Class H	3,890
QY715-UZ	FMS-11/RSX Class L	1,140
QY301-UZ	Datatrieve/11M(+) Class L	1,560