DEC PDP–11 Family

MANAGEMENT SUMMARY

DEC's PDP–11 family of 16-bit minicomputers has long been a competitor in the commercial applications marketplace. Featuring a range of compatible operating systems and peripherals, as well as a variety of basic system configurations, the PDP–11 group promises to remain a strong contender in that marketplace for the foreseeable future.

The PDP–11 family consists of four basic models: Micro/PDP–11, PDP–11/23–PLUS, PDP–11/24, and PDP–11/44. A fifth system, the PDP–11/23-S, is simply a packaged version of the PDP–11/23–PLUS CPU for OEMs; because of its limited size and target market, the PDP–11/23–S is not covered extensively in this report.

The family is divided into two groups along architectural lines. The Micro/PDP–11 and the PDP–11/23–PLUS are based on DEC's Q–Bus, while the PDP–11/24 and PDP–11/44 are 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 Q–Bus, for example, can only support disk drives with individual capacities up to 28MB; the Unibus, which supports DEC's microprocessor-based Digital Storage Architecture (DSA), can handle drives with capacities up to 456MB.

The Micro/PDP–11 is based on the PDP–11/23 CPU. It is available in floor-standing, tabletop, and rack-mount configurations. Minimum memory is either 256KB or 512KB, expandable to 4MB. The Micro/PDP–11 has 800KB of integral floppy disk storage; some configurations feature a 10MB or 28MB Winchester disk drive, to which another 10MB Winchester drive can be added, for a maximum of 38MB of mass storage. The Micro/PDP–11 can control six concurrently active workstations.

The PDP–11/23–PLUS, like the Micro/PDP–11, is available with either 256KB or 512KB of main memory, expandable to 4MB. It is available in rack-mount or cabinet-based units. The basic PDP–11/23–PLUS is configured with either a 1MB dual-drive diskette subsystem or a 20.8MB dual-drive cartridge disk subsystem; two more ➢

The PDP–11 family is a long-time competitor in the 16-bit commercial minicomputer marketplace. It contains models based on DEC's Q–Bus and Unibus architectures. The PDP–11 family features a range of system configurations, compatible operating systems, and peripherals. Many peripherals are compatible with the VAX–11 family; a recent addition to the list of shared peripherals is the VT200 terminal family.

MODELS: Micro/PDP–11; PDP–11/23–PLUS; PDP–11/23–S; PDP–11/24; PDP–11/44.
MEMORY: 256KB-4MB.
DISK CAPACITY: 10MB-3.6GB.
WORKSTATIONS: Up to 6 on the Micro/PDP–11; up to 10 on the PDP–11/23–PLUS and PDP–11/24; up to 48 on the PDP–11/44. (Concurrent users; number can vary according to application.)
PRICE: $10,125-$60,300 (base system prices).

CHARACTERISTICS

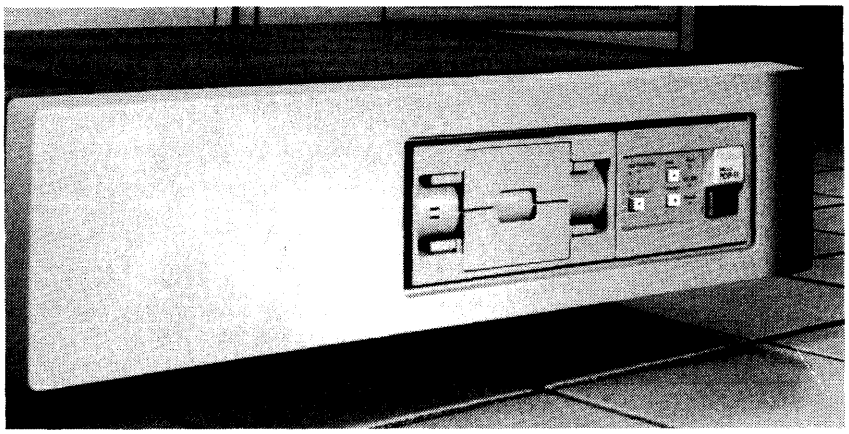
MANUFACTURER: Digital Equipment Corporation (DEC), 146 Main Street, Maynard, Massachusetts 01754. Telephone (617) 897–5111.

CANADIAN ADDRESS: Digital Equipment of Canada, Ltd., P.O. Box 1300, 100 Herzberg Road, Kanata, Ontario, K2K 2A6, Canada.

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. ➤



The Micro/PDP–11 is the low-end system in DEC's PDP–11 family. Based on the PDP–11/23–PLUS CPU, the Micro/PDP–11 supports from 256KB to 4MB of main memory and 10MB to 38MB of mass storage. It can also control up to six concurrently active workstations. The Micro/PDP–11 can run such standard PDP–11 operating systems as RT–11, RSTS/E, and V7M–11 Unix, as well as Micro/RSX, a specially extended version of RSX–11M–Plus.

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CHART A. SYSTEM COMPARISON

MODEL	Micro/PDP-11	PDP-11/23-PLUS	PDP-11/24	PDP-11/44
SYSTEM CHARACTERISTICS				
Date of introduction	6/82	12/81	2/81	11/79
Date of first delivery	5/83	1/82	3/81	6/80
Operating systems	RT-11; RSX-11S; RSX-11M; Micro-RSX; RSX-11M-PLUS; RSTS/E; DSM-11; V7M-11 Unix	RT-11; RSX-11S; RSX-11M; RSX-11M-PLUS; RSTS/E; DSM-11; V7M-11 Unix	RT-11; RSX-11S; RSX-11M; RSX-11M-PLUS; RSTS/E; DSM-11; V7M-11 Unix	RT-11; RSX-11S; RSX-11M; RSX-11M-PLUS; RSTS/E; DSM-11; V7M-11 Unix
Upgradable from	—	—	—	—
Upgradable to	—	—	—	—
MIPS	—	—	—	—
Relative performance (based on DP-11/44 at1.0	0.4	0.4	0.4	1.0
MEMORY				
Minimum capacity, bytes	256K	256K	1M	1M
Maximum capacity, bytes	4M	4M	4M	4M
Type	MOS	MOS	MOS	MOS
Cache Memory	None	None	None	8KB
Cycle time, nanoseconds	560	560	510	490
Bytes fetched per cycle	—	—	—	—
INPUT/OUTPUT CONTROL				
Number of channels	—	—	—	—
High-speed buses	None	None	None	None
Low-speed buses	1	1	1	1
MINIMUM DISK STORAGE	10MB	20MB	20MB	20MB
MAXIMUM DISK STORAGE	38MB	41MB	3.6GB	3.6GB
NUMBER OF WORKSTATIONS	6	10	10	48
COMMUNICATIONS PROTOCOLS	2780/3780, 3270, HASP, SNA, DNA, DDCMP, X.25, 200 UT, Univac 1004	2780/3780, 3270, HASP, SNA, DNA, DDCMP, X.25, 200 UT, Univac 1004	2780/3780, 3270, HASP, SNA, DNA, DDCMP, X.25, 200 UT, Univac 1004	2780/3780, 3270, HASP, SNA, DNA, DDCMP, X.25, 200 UT, Univac 1004

10.4MB cartridge drives can be added, for a maximum of 41.6MB of disk storage. The PDP–11/23–PLUS supports 10 concurrently active workstations. (The OEM PDP–11/23–S is available with either 32KB or 64KB of memory.)

The PDP–11/24 includes a single-board CPU with options for a commercial instruction set and either a floating point processor chip or a hardware floating point unit. The PDP–11/24 features 1MB of memory, expandable to 4MB. It supports Unibus mass storage devices and has a maximum mass storage capacity of 3.6GB. Like the PDP–11/23–PLUS, the PDP–11/24 supports up to 10 concurrently active terminals.

The top-of-the-line PDP–11/44 reportedly offers twice the performance of the PDP–11/24. The PDP–11/44 CPU features 1MB of main memory and an 8KB cache memory; main memory is expandable to 4MB. A commercial instruction set and floating point processor are optional. The PDP–11/44 supports up to 48 workstations in concurrent operation. Mass storage capacity ranges from 20.8MB to 3.6GB.

The PDP–11/24 and PDP–11/44 systems are available in four levels of integration: rack-mount computers, kernel computers, System Building Blocks, and packaged systems. Rack-mount computers allow space for extensive system and memory expansion. Kernel computers are cabinet-mounted systems that permit expansion within the cabinet; they provide a basis for OEMs and end users to build systems tailored to specific applications. System Building Blocks (SBBs) are cabinet-based systems that can be expanded through the addition of specific tape and disk

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 is 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, then 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. A Commercial Instruction Set (CIS) is available on the PDP–11. The CIS is a CPU microcode extension that implements a set of commercial instructions on a variety of data types, including character-string, packed decimal, and numeric formats. The firmware implementation yields much faster program execution times than a similar software implementation.

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

MAIN STORAGE

STORAGE TYPE: Storage types include Parity MOS (Micro/PDP–11 and PDP–11/23–PLUS) and ECC MOS (PDP–11/24 and PDP–11/44).

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

CAPACITY: Ranges from 256KB to 4MB. See Chart A for memory capacities of specific models.

CHECKING: Parity on the basis of one bit per byte is available with dynamic MOS memory for the Mi-

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devices from vendor-determined option lists. SBBs also include the PDP-11 operating system general license, a package of license and warranty options for eight PDP-11 operating systems. Packaged systems are fully configured systems that, as purchased, include the hardware and software components required for a full PDP-11 system.

Eight major operating sytems are available for PDP-11 systems; seven run on all models. *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 Micro/PDP-11 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 activities, including batch processing, interactive data processing, and detached job processing. *DSM-11* is a multiuser data management system with timesharing facilities for interactive users, detached jobs, and other simultaneous activities. *V7M-11 Unix* is an interactive, timesharing, native Unix operating system based on the AT&T standard Version 7 Unix, Seventh Edition; it also features Berkeley Unix enhancements.

DEC continues to enhance the peripherals available for the PDP-11; many of those peripherals are also VAX-compatible. The most recent addition to the PDP-11/VAX-11 peripheral roster is the VT200 family of terminals, announced in late 1983. These terminals extend the features of, and will eventually replace, the popular VT100 family (which will remain in new production for at least two years). The VT200 family comprises the VT220, VT240, and VT241. The low-end VT220 is a monochrome text terminal. The mid-range VT240 and the high-end VT241 are interactive terminals that generate text and medium-resolution bit-map graphics. Both units comprise a monitor, a keyboard, and a system box that contains the power supply and logic; the VT240 has a monochrome monitor, while the VT241 employs a color monitor. All three VT200 terminals feature VT100 emulation capabilities.

COMPETITIVE POSITION

Recently, the 32-bit VAX-11 family has begun to supplant the PDP-11 as DEC's primary general-purpose commercial engine; that could conceivably be taken as a signal of the PDP-11's eventual, if not impending, demise. However, DEC has not by any means abandoned the PDP-11. The availability of the Unix operating system, for instance, is a sign of the company's commitment to keeping the PDP-11

cro/PDP-11 and the PDP-11/23-PLUS. Error correcting and checking (ECC) is a feature of dynamic MOS memory for the PDP-11/24 and PDP-11/44. 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-11/24 and PDP-11/44 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.

CACHE MEMORY: The PDP-11/44 has an integral cache memory of 8KB.

CENTRAL PROCESSORS

GENERAL: The features of PDP-11 processors are discussed in the following paragraphs.

The Micro/PDP-11, the PDP-11/23-PLUS, and the PDP-11/23-S are all based on the Q-Bus. Both the PDP-11/23-S and the Micro/PDP-11 contain a PDP-11/23-PLUS module with bootstrap ROM and diagnostics.

The PDP-11/23-PLUS is a 16-bit, microprogrammed processor with extended addressing capability. Integral to the CPU is the microprocessor chip set also used on the PDP-11/24. The CPU module itself contains the CPU, a memory management unit, a line frequency clock, a bootstrap/diagnostic ROM, and two serial line units. The PDP-11/23-PLUS CPU, in conjunction with its memory management unit, executes instructions in either kernel or user mode.

The PDP-11/23-PLUS processor offers a standard instruction set of 91 instructions. This instruction set includes both single and double operand instructions that operate with bit, byte, 16-bit word, and multiple-word data types. A variety of addressing modes extends the standard instruction set to over 400 instructions common to all PDP-11 processors. In addition to the standard instruction set, an optional microcoded floating point chip provides 46 instructions for single-precision (32-bit) and double-precision (64-bit) floating point data. For applications requiring floating point performance beyond that of the KEF11-A microcoded chip, the optional floating point processor provides additional instructions for faster execution of Fortran programs. A commercial instruction set (CIS) microcoded chip is also available for business applications requiring fast Cobol program execution.

The PDP-11/23-PLUS microcomputer features high-density, parity MOS memory based on advanced 64K RAM chip technology. A single quad-height memory module contains 512K bytes of memory, while a 256K byte memory management facility allows the processor to extend memory addresses to a full megabyte, in conjunction with the extended Q-Bus and address relocation mapping.

The PDP-11/24 and the PDP-11/44 are based on the DEC Unibus. The CPU of the PDP-11/24 is a microprogrammed processor that executes arithmetic and control logic operations to produce fixed point arithmetic, and hardware multiply and divide, and extensive test and branch instructions. Additional microcode, available as an option, allows the

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CHART B. MASS STORAGE

MODEL	RA81	RA60	RA80	RL02	RD51
Type	Winchester	Removable	Fixed	Cartridge	Winchester
Controller model	UDA50	UDA50	UDA50	RLV12 (Q-Bus) or Integrated (Unibus)	RQDX1
Drives per subsystem/ controller	4	4	4	4	4
Formatted capacity per drive, megabytes	456	205	121	10.4	10
Number of usable surfaces	7 data, 1 servo	6 data	7 data, 1 servo	2 data	4
Number of sectors or tracks pearface	2496 tracks	1600 tracks	1092 tracks	512 tracks	1200 tracks
Bytes per sector or track	512/sector	512/sector	512/sector	256/sector	512/sector
Average seek time	28 ms.	41.7 ms.	25 ms.	55 ms.	76.7 ms.
Average rotational/relay time	8.3 ms.	8.3 ms.	8.3 ms.	12.5 ms.	8.3 ms.
Average access time	36.3 ms.	50 ms.	33.3 ms.	67.5 ms.	85 ms.
Data transfer rate	2.2MB/sec.	1.98MB/sec.	1.2MB/sec.	512KB/sec.	625KB/sec.
Supported by system models	PDP-11/24, -11/44	PDP-11/24, -11/44	PDP-11/24, –11/44	Micro/PDP-11, PDP-11/23-Plus, -11/24, –11/44	Micro/PDP-11, PDP-11/23-Plus

competitive in a marketplace in which Unix systems are proliferating. Another sign of support is the continuing addition of compatible peripherals.

The PDP–11 is one of the original heavyweights in the 16-bit marketplace, and, as such, competes against almost any 16-bit machine currently available (except, perhaps, for some specific small business 16-bit minis), and particularly against 16-bit offerings from other major minicomputer vendors. That lineup of competitors includes, among others, Data General's Eclipse line, Hewlett-Packard's HP 1000 Series, Wang's VS Series, Honeywell's DPS 6, and Modcomp's Classic II Series.

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. Finally, the compatibility between many PDP–11 and VAX–11 peripherals permits users to transfer peripherals and, thus, reduce migration costs if they move to the larger VAX–11 systems.

The PDP–11's most significant disadvantage in the marketplace results from the continuing erosion of the market for traditional 16-bit minicomputers. The low end has been encroached on by microcomputers and the higher end by more powerful 32-bit superminis, both of which deliver increased performance for better relative price than their low-end and high-end minicomputer counterparts. DEC has obviously met the challenge at the low end with the Micro/PDP–11 and the PDP–11/23; how the higher end of the line will continue to fare remains an open question. However, the PDP–11 remains a popular series, with many third-party software packages and peripherals available. The PDP–11's entrenched user and vendor bases indicate that the family as a whole still has a solid future.

USER REACTION

Two-hundred and thirty-one users representing 346 PDP-11 minicomputers responded to Datapro's 1983 User Sur-

execution of single- and double-precision (32- and 64-bit) floating-point instructions. The floating point unit provides 46 additional instructions for high-speed floating point computation. The PDP–11/24 also contains standard PDP–11 instructions, plus the extended instruction set, memory management, power/fail automatic restart, six general purpose registers, two stack pointers, and one program counter. An additional register, the CPU error register, permits system software error logging.

The integral memory management unit of the PDP–11/24 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 optional 22-bit translation is offered to ensure compatibility with other members of the PDP–11 family.

The PDP–11/44 CPU also contains fixed point arithmetic with hardware multiply and divide, extensive test and branch operations, and other control operations as well as room for the addition of the floating point processor, commercial instruction set, and Unibus options. The PDP–11/44 processor acts as the arbitration unit for Unibus control by regulating bus requests and transferring control of the bus to the requesting device with the highest priority.

The PDP–11/44 cache memory is integrated into the processor. It is an 8KB high-speed RAM memory, organized as a direct mapped cache with write-through features.

CONTROL STORAGE: Information unavailable from vendor.

REGISTERS: The Micro/PDP–11, PDP–11/23–PLUS, and PDP–11/24 have nine general purpose registers. The PDP–11/44 has 10 general registers, which can be used as accumulators, index registers, or stack pointers. One of the general registers is used as 11/44's program counter, and three others are used as the processor stack pointers, one for each operational mode.

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 In-

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vey. The average life of the systems represented in the survey was approximately 48 months. Two-hundred and five users purchased their systems, 23 leased from a third party, and 3 rented or leased from the manufacturer. One-hundred and forty-two respondents were first-time computer users. The types of industries represented most in the survey were Education, Manufacturing, Retail/Wholesale, Engineering/Scientific, and Government. The principal applications performed on these PDP–11s were accounting/billing, engineering/scientific, order processing/inventory control, payroll/personnel, and sales distribution. The main source of application programs came from in-house personnel (71 percent).

Ninety-six percent of the users surveyed employed local workstation/terminals. Only 63 percent, however, used remote workstation/terminals. Memory capacities ranged from a low of 32KB (five users) to over 8192KB (two users). Among the 231 users, total disk storage ranged anywhere from 1MB to over 1200MB. Seventy-five users employed a data base management system while another 28 planned to install one in 1983. The programming languages used most were Basic (87 users) and Fortran (42 users). One-hundred users had a disaster recovery plan while 26 more planned to install one in 1983. When asked if they expected to replace their systems in 1983, 184 users said no, 30 said yes with the same manufacturer, and 7 said yes with a different manufacturer. The 231 users rated their PDP–11s as shown in the chart below.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	109	109	6	4	3.4
Reliability of mainframe	141	75	9	1	3.6
Reliability of peripherals	96	100	24	4	3.3
Maintenance service:					
Responsiveness	110	86	22	4	3.2
Effectiveness	83	103	28	6	3.1
Technical Support:					
Trouble-shooting	43	108	46	15	2.7
Education	29	115	47	17	2.7
Documentation	37	107	57	16	2.7
Manufacturer's software:					
Operating system	92	102	20	4	3.2
Compilers and assemblers	68	112	26	3	3.2
Applications programs	34	83	32	6	2.9
Ease of programming	69	119	25	2	3.1
Ease of conversion	40	84	36	10	2.9
Overall satisfaction	86	118	14	5	3.2

*Weighted Average based on a scale of 4.0 for Excellent.

When asked to state the significant advantages of their systems, 62 percent stated that the system was easy to expand/reconfigure, 54 percent said they were happy with the response time, 30 percent said that terminals/peripherals carried over from other systems are compatible as the vendor promised, and 27 percent stated that programs/data carried over from other systems are compatible as the vendor promised. On the other hand, when asked to state the significant problems with their systems, only 14 percent said that system costs (for hardware, vendor-supplied software, support) exceeded the expected total, 12 percent stated that the computer proposed by the vendor was too small, and 11 percent claimed that the delivery of required

dexed Indirect. The eight modes can allow a specific operation code (e.g., MOV, for move) to accomplish register/register, register/memory, memory/memory, memory/stack, and register/stack manipulation.

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

OPERATING ENVIRONMENT: The Micro/PDP–11 comes in a rack-mount, floor stand, or tabletop enclosure. The rack-mount enclosure is 5.2 inches high, 19 inches wide, and 25 inches deep; the floor stand 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 rack-mount and floor stand models each weigh 70 pounds; the tabletop model weighs 55 pounds. Power requirements are 120 VAC, 60 Hz, 90-128 VRMS or 240 VAC, 50 Hz, 180-256 VRMS. Permissible operating temperature range is 50°F-104°F at 10%-90% humidity.

The PDP–11/23–PLUS is available in cabinet-mounted or rack-mount versions. The cabinet-mounted version is 41.8 inches high, 21.3 inches wide, and 30 inches deep; it weighs 375 pounds. Power requirements are 120 VAC, 60 Hz, 90-132 VRMS or 240 VAC, 50 Hz, 180-264 VRMS. Operating temperature is 50°F-104°F at 10%-90% humidity. The rack-mount CPU box is 5.2 inches high, 19 inches wide, and 26.8 inches deep; it weighs 46.5 pounds. Electrical requirements are 120 VAC, 60 Hz, 90-132 VRMS or 240 VAC, 50 Hz, 180-264 VRMS. Operating temperature range is 41°F-122°F at 10%-95% humidity.

The PDP–11/24 comes in two types of cabinets: 5.2 inches high, 19 inches wide, and 25 inches deep or 10.4 inches high, 16.6 inches wide, and 26 inches deep. The PDP–11/24 CPU box weighs either 45 or 70 pounds. Power requirements are 120 VAC, 104-127 or 90-128 VRMS or 240 VAC, 208-258 or 180-256 VRMS. Operating temperature range is 41°F-122°F at 10%-95% humidity.

The PDP–11/44 processor cabinet is 10.4 inches high, 16.2 inches wide, and 26 inches deep; the CPU box weighs 90 pounds. Power requirements are 120 VAC, 90-128 VRMS or 240 VAC, 180-256 VRMS. Operating temperature is 41°F-122°F at 10%-95% humidity.

I/O CONTROL: I/O control on the PDP–11/24 and PDP–11/44 is handled through the Unibus, 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, including 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 Micro/PDP–11 and the PDP–11/23–PLUS 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. General configuration information is given in the following paragraphs.

Micro/PDP–11 systems are configured with either 256KB or 512KB of memory and a 5¼-inch, 800KB RX50 diskette subsystem. Memory can be expanded to 4MB in increments of 256KB or 512KB. Some systems also include a 5¼-inch 10MB or 28MB Winchester disk. Each Micro/PDP–11 can support an additional RD51 10MB Winchester disk.

PDP–11/23–PLUS systems include 256KB or 512KB of

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CHART C. TERMINALS

DEVICE	DESCRIPTION
VT220–A, –B, –C	VT200 monochrome video display terminal; white (A), green (B), or amber (C) phosphor screen; advanced video features; programmable function keys; line drawing character set; 24 lines x 80 or 132 characters; communication speeds to 19,200 baud; EIA and mA standard interface; VT100 and VT52 compatibility modes
VT240–A, –B, –C	VT240 monochrome video display terminal; white (A), green (B), or amber (C) screen; shares features VT220–A, –B, –C; of comprises monitor, keyboard, and system box with power supply and logic; integral modem optional; VT100, VT52, and Tektronix 4010/4014 compatibility modes; word processing keyboard available
VT241–AA	VT241 color graphics terminal; shares characteristics of VT240
VT100–AA(AB)	VT100 tabletop video display terminal; operates on full duplex asynchronous communications lines; standard EIA interface; 50 to 19,200 bps baud rate; 24 lines x 80 characters or 14 lines x 132 characters (selectable); 7 x 9 dot matrix, 2 dot descenders; 94-character ASCII and 32 special graphics characters
VT100–WA(WB)	VT100 tabletop video display terminal with advanced video and word processing keyboard
VT101–AA(AB)	VT101 tabletop video display terminal; operates on full-duplex, asynchronous communications lines; standard EIA interface; 50 to 19,200 bps baud rate; 24 lines x 80 characters ASCII with 32 special graphic characters; 83-key detachable unit; standard numeric/function keypad
VT102–AA(AB)	VT102 tabletop video terminal; 50 to 19,200 bps baud rate; 24 lines x 80 characters or 132 characters; 7 x 10 dot matrix with 2 dot descenders; 94-character ASCII set with 32 special graphics characters; US and British character sets standard, others optional; normal or reverse video, blinking, underline, and bold characters on a character-by-character basis; standard numeric/function keypad
VT102–WA(WB)	VT102 tabletop video display terminal with word processing keyboard
VT125–AA(AB)	VT125 tabletop graphics terminal; EIA/CCITT interface; 50 to 19,200 bps baud rates; even, odd or none (keyboard selectable parity); 768 x 240 pixel graphics resolution; printer port for graphics mode; 24 lines x 80 characters or 14 lines x 132 characters; 7 x 10 dot matrix with descenders; 96-ASCII character set (upper-/lowercase; numeric and punctuation) with 32-character special graphics set; split-screen capability
VT125–WA(WB)	VT125 tabletop graphics terminal with advanced video capability and word processing keyboard
VT131–AA(AB)	VT131 video terminal with full VT102 capability plus local editing and block mode transmission
RT100–AA(AB), –BA(BB)	RT100 ruggedized video terminal for industrial environments; includes sheet-steel case, filtration system, and hinged keyboard; –AA(AB) has EIA interface, –BA(BB) has 20 mA interface
RT102–AA(AB), –BA(BB)	RT102 ruggedized video terminal for industrial environments; –AA(AB) has EIA interface, –BA(BB) has 20 mA interface
RT137–AA(AB), –BA(BB)	RT137 bar code terminal; includes RT100 video terminal with bar code reader, bar code keyboard, VT100 keyboard, and light pen; –AA(AB) includes EIA interface, –BA(BB) includes 20 mA interface
VS11–FA	VS11 Unibus systems color raster graphics display station; includes image processor, image memory and synchronous generator module, joystick, and optional 19-inch monitor; 16 discrete colors; 512 x 512 resolution
VS11–FC(FD)	VS11 Unibus systems color raster graphics display station; shares features of VS11–FA and includes second frame buffer
LA12–AB	LA12 DECwriter Correspondent hardcopy terminal; includes 80/150 cps printer; integral 1200 baud dial-through-keyboard modem; 300 baud coupler; EIA interface; carrying case
LA12–CB	LA12 DECwriter Correspondent hardcopy terminal; same as LA12–AB, but without 1200 baud modem
LA12–D	LA12 DECwriter Correspondent hardcopy terminal with RS–232–C interface
LA100–BA, –CA	LA100 Letterwriter 100 keyboard send/receive hardcopy terminal; includes 30/80/240 cps printer; –CA includes VT100 line drawing kit
LA120–DA	LA120 DECwriter keyboard send/receive hardcopy terminal; includes 180 cps bidirectional printer

software was late and that the equipment was excessively noisy. When asked if their PDP–11s did what they were expected to do, 202 said yes and 15 were undecided. When asked if they would recommend the system to another user, 188 said yes but 26 were undecided. □

memory and either one RLV22 disk subsystem (one controller and two 10.4MB RL02 cartridge disk drives) or one RXV21 diskette subsystem (one controller and two 0.5MB RX02 drives). Memory can be expanded to 4MB in 256KB or 512KB increments; two more RL02 cartridge drives can be added to those systems that initially support two RL02s, for a system total of four.

The Micro/PDP–11 and the PDP–11/23–PLUS also support the TSV05, a 1600 bpi, PE tape subsystem.

The Unibus-based PDP–11/24 and PDP–11/44 are available in four levels of integration: rack-mount models providing space for further expansion; cabinet-mounted kernel computers that provide a base for OEM system integration; System Building Blocks (SBBs) that include the PDP–11 General Operating System License and allow the user to expand the system by choosing from a variety of disk and tape devices; and packaged systems that include all necessary hardware and software components.

Both the PDP—11/24 and the PDP–11/44 support 1MB of memory, expandable to 4MB in 1MB increments. For mass storage, they support 121MB RA80 and 456MB RA81 fixed disk drives, 205MB RA60 removable disk drives, and

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CHART D. PRINTERS

MODEL	LA100	LQP02	LA50	LXY
Type	Letter-quality	Letter-quality	Dot-matrix	Dot-matrix
Speed	30/80/240 cps	32 cps	50/100 cps	170 lpm-600 lpm
Bidirectional printing	No	Yes	No	No
Paper size	Up to 15 inches	Up to 13.5 inches	Up to 10 inches	—
Character formation	—	Daisywheel	7 x 9 dot matrix	Variable
Horizontal character spacing (char./inch)	Variable	10 or 12	5-16.5	Variable
Vertical line spacing (lines/inch)	Up to 12	6 or 8	Up to 12	—
Character set	Varies	Over 25 different sets	94	96 ASCII
Controller/Interface	RS-232-C	RS-232-C	Attaches to VT100 or VT200 terminal, or PC	LP11/RS-232-C
No. of printers per controller/interface	—	—	—	—
Printer dimensions, in. (h x w x d)	7 x 22 x 15.5	7 x 25 x 16	5 x 16 x 11.8	46.5 x 30 x 24.3
Graphics capability	Yes	No	Yes	Yes

CHART D. PRINTERS (Continued)

MODEL	LP25	LP26	LP27	LN01
Type	Band	Band	Band	Laser
Speed	300/215 lpm	600/445 lpm	1200/800 lpm	12 pages/minute
Bidirectional printing	No	No	No	No
Paper size	Up to 15 inches	Up to 15 inches	Up to 18.75 inches	8½ x 11 or 8½ x 14 inches
Character formation	Variable	—	—	300 x 300 dots per inch
Horizontal character spacing (char./inch)	Variable	—	10	—
Vertical line spacing (lines/inch)	6 or 8	6 or 8	6 or 8	8.57
Character set	64/96	64/96	64/96	188
Controller/Interface	LP11	LP11	Integrated	LP11/Parallel
No. of printers per controller/interface	—	—	—	—
Printer dimensions, in. (h x w x d)	43.8 x 30.3 x 33.6	43.8 x 30.3 x 33.6	43.8 x 35 x 38	36 x 25.8 x 26
Graphics capability	No	No	No	No

10MB RL02 cartridge drives, along with RX02 dual 0.5MB floppy drives. The PDP–11/24 and PDP–11/44 also support TU80 1600 bpi, PE tape drives and TU77 and TE16 800/1600 bpi, NRZI/PE tape drives.

WORKSTATIONS: From one to sixteen workstations can be configured on PDP–11 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.

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 sixteen can be attached to RSTS/E-based systems.

MAGNETIC TAPE: Up to eight magnetic tape subsystems can be attached to PDP–11 systems.

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.

MASS STORAGE

See Chart B.

INPUT/OUTPUT UNITS

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

COMMUNICATIONS CONTROL

Data communications control for all PDP–11s is supplied by numerous interface controllers. However, each of these has a number of variants and options so that PDP–11s can be connected to a variety of communication channels (private phone, dial-up phone, 20 mA line, telegraph line), many types of terminals, and a variety of modems. Supplementing these interfaces is additional data communications hardware to provide flexibility in unique situations. Please refer to the PDP–11 Equipment Price list in this report for a complete listing of PDP–11 Communication and Realtime I/O devices.

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 time-sharing system; and the RSX–11 real-time multiprogramming systems: RSX–11M and RSX–11M–Plus; RSX–11S; and DSM–11. Several other operating systems are available, including: V7M–11 Unix; CTS–300; Micro–RSX; and MicroPower/Pascal. These systems are discussed in the following paragraphs.

***RT–11* is a compact, single-user, real-time 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. Optional software supported by RT–11 includes Fortran IV/RT–11, Basic–11/RT–11, MU Basic–11/RT–11 V2.1, DECnet–RT, and FMS–11/RT–11, Digital's Forms Management System.**

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CHART E. MAGNETIC TAPE EQUIPMENT

MODEL	TSV05	TU77	TE16	TU80
TYPE	Reel to reel	Reel to reel	Reel to reel	Streaming
FORMAT				
Number of tracks	9	9	9	9
Recording density, bits per inch	1600	1600/800	1600/800	1600
Recording mode	PE	PE/NRZI	PE/NRZI	PE
CHARACTERISTICS				
Controller model	Integrated	Integrated	Integrated	Integrated
Drives per controller	1	4	8	1
Storage capacity, bytes	40M	40M (1600 bpi) 20M (800 bpi)	40M (1600 bpi) 20M (800 bpi)	40M
Tape speed, inches per second	100	125	45	100
Data transfer rate, units per second	40K/160K	200K	72K (1600 bps) 36K (800 bps)	160K
Streaming technology	Yes	No	No	Yes
Start/stop mode; speed	Yes; 25 ips	—	—	Yes; 25 ips
Switch selectable	—	Yes	Yes	No

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. Users can construct files that contain strings of commonly issued keyboard monitor commands. By executing only the indirect file, users can invoke the stream of commands. Indirect command files provide capabilities similar to batch processing, but do not require users to learn the job control language. RT–11 does, however, also include a batch facility.

RT–11 offers program development tools including a choice of three text editors, file and device maintenance utilities, an online debugger, and patch utilities. With DECnet RT, RT–11 systems can be linked with other Digital operating systems for network operation. Using Internet protocol emulators, RT–11 can communicate with IBM mainframe systems or other systems that support Binary Synchronous Communication (BSC) protocols.

***RSTS/E (Resource Sharing Timesharing System/Extended)* is an interactive, multiuser, multitasking, general purpose operating system. Standard with all RSTS/E systems are Basic-Plus and Basic-Plus editor, Macro–11 assembly language, RMS (Record Management Services) data management subsystem, and the Sort–11 utility; it supports Basic-Plus–2, PDP–11 Cobol, Cobol 81, FMS11/RSTS/E, Fortran IV, Fortran 77, Datatrieve–11 data inquiry and report writing package, DECnet/E Phase III, DECword/DP and the RSTS/E–2780, RSTS/E/3271, and RSTS/E High Performance 2780/3780 Protocol Emulators for IBM interconnects. 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 communication, disk data cache, overlapped seeks, and file placement control.

RSTS/E application development tools include high-level languages, data management and file processing facilities, program development aids, and communications capabilities. RMS and Sort–11 provide extensive file processing and data management services, i.e., sequential, relative, and multikey ISAM support, file sharing, and protection mechanisms. Using facilities that support multiple job terminals, some RSTS/E systems can support up to 127 concurrent terminal users, even though the maximum number of simultaneous jobs per RSTS/E system is limited to 63.

***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. Optional software includes Basic–11/IAS–RSX, Basic–Plus–2, Coral 66, Fortran IV/IAS–RSX, Fortran IV–Plus, PDP–11 Cobol, DECnet–11M Phase III, and the Sort–11 utility. Optional data management services include FMS–11/RSX, a forms management system, RMS–11K, record management services, Datatrieve–11, a record management services query language, and DBMS–11, a data base management system. RSX–11M systems support up to 32 simultaneous users.**

RMS (Record Management Services) is a superset of FCS (File Control Services), the basic file handling system for RSX–11M/RSX–11M–Plus systems, and is compatible with FCS written files. RMS has two variations: RMS–11, which comes with the RSX–11M operating system, and RMS–11K, which is optional and provides the additional capability of multikey indexed sequential file organization. RMS permits relative, sequential, and single-key indexed sequential file organizations, and sequential, random, and record file address access modes.

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–11/24 and PDP–11/44 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.

Standard on all RSX–11M–Plus systems are the Macro–11 assembly language and the Files–11 data management services file system that provides volume structuring and pro-

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tection, FCS, RMS–1K, and the EDI and EDT editors. Optional software includes Basic/11/IAS–RSX, Basic-Plus–2, Fortran IV/IAS–RSX, Fortran IV–Plus, PDP–11 Cobol, DECnet–11M–Plus Phase III, and the Sort–11 utility. Optional data management services include FMS11/RSX, Datatrieve–11, and DBMS–11. 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.

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. Many users can access DSM–11 simultaneously and be relatively unaffected by the activities of other users. Digital Standard MUMPS, an extension of the American National Standard Specification, is a high-level language oriented towards solving database problems. It can be used by programmers with little programming experience. The language's text-handling capabilities allow the inspection of any data item for content or for format. Other text-handling capabilities include the ability to concatenate text strings and to segment text.

Other features of the DSM–11 operating system are: high-performance database handler using memory-resident cache or disk data for data sharing among users; distributed database management implemented using DMS11/DMR11 high-speed data links; online, high-speed, database backup, disk media preparation and bad-block management, and tape-to-tape copying; automatic powerfail restart capability; and hardware device error reporting, system patching utility, and executive debugger for system maintenance.

V7M–11 Unix is an interactive, timesharing, native Unix operating system based on the AT&T standard version 7 Unix Timesharing System, Seventh Edition. 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. V7M–11 also incorporates the Berkeley Unix full screen editor and a version of the Berkeley User Overlay Scheme for large programs.

Other features of V7M–11 Unix include: disk bad block replacement; fully automatic system generation; system management commands; overlay kernel for CPUs without separate I and D space; and a crash dump analyzer.

CTS–300 is a disk-based, single-user or multiuser operating system for commercial applications on smaller PDP–11 systems. CTS–300 applications are written in Dibol, DEC'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.

Single-user Dibol allows one Dibol user or job to be run on a system; it requires only an entry-level system running on 32KB of memory. Time-Shared Dibol allows one or two users or two to four jobs to run simultaneously; it requires a medium system with at least 56KB of memory. Extended memory TSD allows up to 12 Dibol users or up to 16 Dibol jobs to run simultaneously; up to 12 can be attached to terminals, with the rest running in a detached environment.

CTS–300 also features: DKED, an editor that lets users create and modify Dibol programs online; an interactive command language; and Data Management Services (DMS), which handles sequential, random, or indexed sequential access method (ISAM) structured files.

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 in both realtime and timesharing environments. Micro–RSX is packaged on an RX50 floppy disk and is customer-installable. Micro–RSX comprises two separate packages: the Base Kit and the Advanced Programmer's Kit. The Base Kit provides the RSX–11M–Plus Executive, utilities and device drivers, support for user mode program development in high-level languages, and a user documentation kit. The Advanced Programmer's Kit contains software and documentation for Macro privileged mode program development; it includes a Macro assembler, a librarian, and system libraries for privileged mode programming.

MicroPower/Pascal 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.

MicroPower/Pascal uses a two-processor development environment comprising a host PDP–11 running the RT–11 Extended Memory (XM), on which the Pascal compiler and development utilities reside and execute, and a target Q–Bus PDP–11, on which the application program resides and executes. The Pascal code for MicroPower/Pascal is structured in independent processes, which appear to execute simultaneously; each process cooperates with other processes in manipulating memory and shared peripheral devices.

DATABASE MANAGEMENT SYSTEMS: PDP–11 systems do not employ separate database management systems.

LANGUAGES: DEC offers several major programming languages for the PDP–11 family of computers.

Fortran IV is an extended superset of the ANSI X3.9–1966 standard. It features a high-speed, one-pass optimizing compiler and can produce absolute binary code suitable for standalone PDP–11 systems or for loading into ROM or PROM memory. Other features of Fortran IV include: the ability to use general expressions in all meaningful contexts; mixed-mode arithmetic; the BYTE data type for character manipulation; commenting at the end of each source line; and list-directed input/output.

Dibol–11, DEC's Business-Oriented Language, is a high-level language for commercial applications programming. It is similar to Cobol in that it has a DATA DIVISION and a PROCEDURE DIVISION, and uses English-like procedural statements. Unlike Cobol, Dibol–11 is designed specifically for creating interactive applications programs. DECform, a data entry and file inquiry package, is included with Dibol–11 for designing data entry screen formats.

Both Dibol–11 and DECform have interactive debugging utilities. Dibol–11 performs data manipulation, arithmetic expression evaluation, table subscripting, record redefinition, external calls to other programs, and both sequential

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and random access to files. DECform features facilities for defining data entry field protection, autoduplication, alphabetic or decimal checking, range checking, field totaling, crossfield validation, and auto-increment of counters.

Basic–11/RT–11 is a conversational programming language utilizing English-like statements and familiar mathematical notations to perform operations. It is an incremental, interactive, interpretive compiler; it features: support for real, integer, double precision and string data types; immediate mode statements for debugging and desk calculator usage; sequential data storage using the RT–11 file system; string capability, including string arrays and functions; disk virtual arrays for string, integer and real data types; chaining with COMMON to accommodate large programs; CALL facility for invoking assembly language subroutines using a PDP–11 Fortran-compatible call interface; and formatted output using the PRINT USING statement.

PDP–11 Basic–Plus–2 is a superset of the Basic-Plus and Dartmouth Basic languages. The language processor is composed of a compiler and an Object-Time System/Library that contains the following run-time routines: library and arithmetic functions; dynamic allocation of string storage and I/O buffers; I/O operations handling; and processing errors in arithmetic, I/O, and system operations.

Coral 66 is a high-level block-structured programming language for real-time and process control applications. Features of Coral 66 include: BYTE, LONG (32-bit integer) and DOUBLE (64-bit floating point) numeric types; reentrant code at the procedure level; executable generated code; switchable options to select target PDP–11 computer instruction sets, optimize generated code, check the bounds of array-type variables, control listing output, or read card format; and conditional compilation of defined parts of source code.

Cobol–81 is a Cobol compiler for small RSTS/E systems. Cobol–81 can compile at 500 lpm on a PDP–11/44 and is upward compatible with VAX–11 Cobol. Cobol–81 supports numeric COMP–3 packed-decimal data; numeric COMPUTATIONAL (COMP) binary data; alphanumeric DISPLAY data (ASCII); and NUMERIC DISPLAY data (ASCII). The compiler's sequential I/O and multikey indexed I/O modules meet the full ANSI–74 Level 1 standards. Additional I/O features include variable-length records through extensions to the RECORD SIZE clause and the ability to designate indexed input files as OPTIONAL. Cobol–81 runs on any PDP–11 system with an extended instruction set.

PDP–11 Fortran–77 is an optimizing, high-performance compiler for the RSX and RSTS/E operating systems. It is an extended implementation of the subset Fortran language defined by the ANSI standard. It is both a compatible superset of PDP–11 Fortran IV–Plus and a subset of VAX–11 Fortran. PDP–11 Fortran–77 programs can be recompiled for use on a VAX system without changes to the source code. Fortran applications using any subset ANSI 77 features will run on this compiler. If programs use only ANSI 77 features, they should run with little or no modifications. Among the major features defined by the ANSI subset are a CHARACTER data type and a BLOCK IF construct including IF . . . THEN, ELSE IF, ELSE, and END IF statements, for conditional execution of blocks of statements.

Pascal/RSX is a high-level language that includes the features of the Level 0 ISO Specification for Computer Programming Language Pascal (Draft Proposal 7185), along with extensions. It features sequential or direct record access, plus fixed- or variable-length records. Pascal/RSX runs on all RSX–11M- and RSX–11M–Plus-based systems with Extended Instruction Set (EIS).

COMMUNICATIONS: DEC offers a number of software products both for communication among DEC machines and for access to networks that include other vendors' systems. Those products are discussed in the following paragraphs.

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

The *RT–11 2780/3780 Protocol Emulator (PE)* runs under the RT–11 Foreground/Background (FB) or Extended Memory (XM) monitor on a suitably equipped RT–11 system, providing emulation of an IBM 2780 or 3780 remote batch terminal. Any block addressable storage device supported by RT–11 can be used as a source of transmission files and any block addressable storage device or line printer supported by RT–11 can be used to receive files. Features supported by the RT–11 2780/3780 include commands for unattended operation, 2780 multiple record transmission option, transparent mode, 3780 space compression, variable horizontal forms control, and print and punch component selection on receive. A DUV11 or DUP11 synchronous communications interface is required.

The *RSX–11 2780/3780 Emulator* emulates the communications protocol of an IBM 2780/3780 device while running as a user job under a suitably equipped RSX–11M or RSX–11M–Plus system. It appears as an IBM 2780 or 3780 data transmission terminal on a point-to-point switched or nonswitched synchronous data link operating with standard 2780/2780 protocol, and can transmit and receive data and/or job control files with an IBM System/370, including 303X processor systems. On a mapped system, the RSX–11 2780/3780 Emulator also supports a spooling feature which allows users to queue one or more files for subsequent transmission or printing. Features include transmission from disk storage devices; transmission of queuing requests during unattended operation; binary or EBCDIC transmission; support of line speeds up to 9600 bps; automatic retry of unattended mode transmissions; error log recording and loopback facilities; and vertical and horizontal print format control.

The *RSX–11/3271 Protocol Emulator (PE)* permits user tasks running on a PDP–11 to communicate interactively with user jobs running on an IBM 360, 370 or 303X host system. The user task presents itself to the IBM system as an IBM 3277 display unit attached to an IBM 3271 control unit operating in slave mode. The protocol emulator operates as a device driver under RSX–11M, maintaining the synchronous line discipline on one side and interfacing with the user tasks on the other. The Protocol Emulator module supports up to six synchronous lines, each of which can be viewed by the 360 or 370 as a 3271 controller. The maximum number of RSX–11M user tasks that can be supported by each pseudocontroller is 32. The maximum number of supported lines and user tasks is a function of application requirements and buffer constraints.

RSX–11M/IAS RJE/HASP is a software package for performing the standard functions of an IBM HASP Remote Job Entry Workstation. RJE/HASP provides multileaved (pseudosimultaneous, bidirectional) communication of up to seven input and seven output data streams. Standard HASP protocol features include data compression of repeated sequential characters, including blanks; full EBCDIC transparency; and multileaving. Communications line control is performed directly by one of the RJE/HASP task. Concurrent use of the communications device by other RSX–11M or RSX–11M–Plus tasks is precluded. Any mass storage or

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unit record device supported by RSX–11M or RSX–11M–Plus can be used as a source or destination of data from a HASP data stream.

The *RSX–11M/SNA Protocol Emulator* provides an RSX–11M system with the ability to participate in an IBM Systems Network Architecture (SNA) network. RSX–11M/SNA enables the RSX–11M user application programs to communicate with IBM application programs or system services on a task-to-task basis. RSX–11M/SNA supports up to 4 half-duplex or full-duplex synchronous lines at speeds up to a maximum of 61 user sessions. The supported communications devices are DUP11s. Coresidency with DECnet–11M or with RSX–11/3271 is not supported.

RSX DLX–11 is a low-overhead software communications line interface which provides users of Digital microcomputers access to Phase III DECnet networks. The product is available on the RSX–11M system for interfacing with a DECnet–11M or DECnet–11M–Plus Phase III mode. RSX DLX–11 supports a single physical line in a point-to-point or multipoint connection. A user-written MACRO–11 program at each end of the line controls the communication line directly. The integrity and sequentiality of data sent over the line are maintained by the use of DECnet Digital Data Communication Message Protocol (DDCMP).

RSTS/E 2780 Emulator software emulates the communications protocol of an IBM 2780 device while running as user job under a suitably configured RSTS/E system. It will transmit files stored on input media (video or hardcopy terminals, lineprinter and card readers) and store files on output media supported by RSTS/E.

The *RSTS/E High Performance 2780/3780 Emulator* emulates the communications protocol of an IBM 2780/3780 device while running as a user job under a suitably equipped RSTS/E system. It appears as an IBM 2780 or 3780 transmission terminal on a point-to-point switched or non-switched synchronous data link operating with standard 2780/3780 protocol, and can transmit data and job control files to, and receive them from, IBM 370s and 303X processor systems. Features include multiple record transmission; automatic retransmission and retry; CPU offloading of modem/line control and BSC protocol; short record (EM) detection for received files; and vertical and horizontal print format control. This option requires a DUP11–AP line interface.

The *RSTS/E 3271 Protocol Emulator* permits user jobs running under the RSTS/E operating system to communicate interactively with user tasks running on an IBM 370 or 303X host system. The RSTS/E user program can be written in either Basic–Plus, Basic–Plus–2, Cobol, or Dibol. The IBM application program must run under either the IMS/VS or CICS/VS DB/DC systems. The package makes it possible for users to have remote, on-line access to IBM data bases, for the purposes of information entry, retrieval, update, or file transfer. Other features include line discipline, user job interface, and CPU off-loading. This option requires a DUP11–AP line interface.

Mux200/RSX–IAS is a software package that provides communications with a CDC 6000 Cyber series or other system using the 200 UT 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. The software package can be configured to support either ASCII or external BCD versions of the communications protocol. Mux200/RSX–IAS enables several users to communicate simultaneously with a host system over a single line. The PDP–11 system, while using a single physical drop, appears to the host as a number of multidrops and terminals on the circuit.

UN1004/RSX is a software package which provides communication between a Unibus-based RSX–11M system and a Univac 1100 series or another type of system using the Univac 1004 RMS–1 communications protocol. The software provides remote job entry (RJE) terminal emulation through which the user can send data in 80-column card format and receive data in line or card format. UN1004/RSX supports one synchronous communications circuit to a host computer, a single switched or dedicated lease line, 2-wire or 4-wire common carrier facility at transmission rates up to 4800 bpi, and ASCII line communications code. Only full duplex console terminals may act as emulator terminals.

RSX–11 PSI (Packetnet System Interface) 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. Terminals connected to a host RSX–11M or RSX–11M–Plus system cannot act as network terminals to other systems connected to the network. Access to RSX–11 PSI/M or RSX–11 PSI/M–Plus is supported for RSX–11M user programs written in Macro–11, Fortran–IV, and Fortran–77. The communications discipline used is the CCITT V.24 (EIA–RS–232) at the hardware level, and symmetric LAPB variant of the X.25 frame level protocol and the X.25 packet level protocol.

RSX–11 PSI/M and RSX–11 PSI/M–Plus can coexist with, or operate as a layered product under DECnet–11M or DECnet–11M–Plus, allowing the use of DECnet facilities over PPSNs as well as private leased lines or switched telephone networks. The Packetnet System Interface supports a subset of Digital Network Architecture's management features including loading and unloading software, defining lines, and providing access to error counters and other maintenance functions. RSX–11 PSI/M and RSX–11 PSI/M–Plus have been certified and are warranted on the following networks: Transpac (France), Datex–P (Germany), PSS (United Kingdom), and Telenet (USA).

Communication with other DEC computer networks is handled through *DECnet*, a Phase III network product that allows a suitably configured system to participate as a routing or nonrouting (end) mode in DECnet computer networks. DECnet offers task-to-task communications, utilities for network file transfer, homogeneous network command terminal support, and network resource capabilities, using the DEC Network Architecture (DNA) protocols. DECnet communicates with adjacent nodes over synchronous and asynchronous communications lines and parallel interfaces. Communication using X.25 circuits over selected public packet-switching networks is also possible when configured with the appropriate PSI product.

Among DECnet's principal features are:

- Task-to-task communication—enables two programs to exchange information. These two programs can be running under different operating systems, and can be written in different languages.
- File transfer—exchange of sequential ASCII or binary files; DECnet handles compatibility issues among operating systems. The transfer of file types other than sequential ASCII and binary may also be supported between particular operating systems.
- Remote command file submission and execution—one system can direct another to execute a specified program, either resident on the remote system or sent to the remote

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system as part of the request.

- Down-line loading—programs or whole software systems can be developed on a node with appropriate peripherals and shipped to another.

- Network command terminal—a terminal user at one system may be logically connected to another on the network running the same operating system and act as if directly connected to that route around line or system failures.

- Network management—DECnet products include the tools for monitoring and controlling network operation. These include facilities for tuning network parameters, for logging events, and for testing nodes, lines, modems, and communication interfaces. For monitoring network operation or for testing a new network application, DECnet provides statistical traffic and error information. Access to such network performance information allows potential problems to be solved before they degrade network performance.

A DECnet network may be configured so that each network member is fully connected with every other member, or may communicate with other network nodes through an intermediate or routing network via a user-defined "least cost" path but have the ability to detect and route around line or system failures.

DECnet nodes may communicate with adjacent nodes over synchronous and asynchronous communications lines and parallel interfaces. DECnet nodes may share a communications link in a multipoint configuration, thereby reducing the high cost of multiple, directly connected communications lines. Microwave and satellite link (neither is available from DEC) are also used to connect DECnet nodes. DECnet–11M and DECnet–11M–Plus nodes may communicate with each other with full DECnet functionality across a public packet switching network when used with the Packetnet System Interface (PSI).

RSX DLX–11 is a low-overhead software communications line interface which provides users of DEC's microcomputers access to Phase III DECnet networks. The product is available on the RSX–11M operating system for interfacing with a DECnet–11M or DECnet–11M–Plus Phase III node. RSX–DLX–11 supports a single physical line in a point-to-point or multipoint connection. A user-written Macro–11 program at each end of the line controls the communication line directly. The integrity and sequentiality of data sent over the line are maintained by the use of the DECnet DDCMP protocol.

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. Records can be sequenced by key fields in ascending and descending order. Sort–11 cannot be used to merge two separate files. Sort–11 provides four different user-selectable sorting processes: Record Sort (manipulates records in their entirety); Tag Sort (produces a reordered file by manipulating only the key position of each record); Address Routing Sort (produces a file for the data and multiple address files that are used to access the data in the desired sequences); and Index Sort (produces a separate index file that contains the record SORT key field and a pointer to the record's location in the data file).

OFFICE AUTOMATION: PDP–11 systems are targeted toward general commercial applications, rather than toward Office Automation. However, the PDP–11 does have a word-processing package for use in office environments.

DECword/DP is a software package that puts fully featured word processing in the RSTS/E timesharing environment. It can be run from any terminal used to access a RSTS/E system, and gives end-users the type of text-manipulation features usually associated with standalone word processor equipment. DECword/DP is suitable for regular RSTS/E end-users who need to prepare occasional memos and short reports. DECword/DP provides features such as menu-driven function selection, cut and paste, forward and reverse scrolling, global search and replace, and automatic word wrap. It also offers footnoting, spelling error detection, list processing, and computer-aided instruction in use of the system.

APPLICATIONS: DEC offers numerous data management, program development, and graphics applications. Those applications are discussed in the following paragraphs.

FMS–11 (Forms Management System) is a software package used by applications programmers to build interactive screen-oriented data entry capabilities into application programs. FMS–11 can be used in conjunction with a standard programming language such as Fortran, Cobol–81, or PDP–11 Basic–Plus–2. Components of the FMS–11 package are: the Form Editor for layout and modification of video forms; the Video Keypad Editor for general-purpose text editing of standard ASCII files; the Form Utility for manipulation of FMS forms descriptions during debugging; the Form Driver for performing screen processing at application run-time; and RT–11, the Application Run-Time Supervisor for running application programs independently of programs running on other system terminals.

Datatrieve–11 is an inquiry and report writing system that allows interactive data retrieval, sorting, and updating; report generation and creation; and maintenance and accessing of data dictionary entries that define RMS–11K records. Like RMS–11K, Datatrieve–11 runs under RSTS/E or RSX–11M. The system has capabilities to handle RMS–11K files created by Cobol, Basic–Plus II, DIBOL, and macro assembler programs. Datatrieve–11 provides query commands, parameters for report writing, commands for report writing, statistical functions, and a process for storing often-used statements in the data dictionary as procedures. Datatrieve–11 requires an RSTS/E or RSX–11M configuration including memory management hardware, 64K bytes of user memory, and hardware multiply/divide.

PLXY–11 is a software package designed that provides RT–11, RSX–11M, RSX–11M–Plus, and RSTS/E applications programmers with access to the plotting capabilities of Digital's LXY12/LXY22 lineprinter/plotters. Using the PLXY–11 graphics subroutines, programmers can create software that prints out representations of data in graphs and charts with clear alphanumeric labeling.

The *BCP Bar Code/Block Character* software package lets RSX–11M users print out industry-standard Code 39 bar codes on Digital's LXY12/LXY22 printer/plotters. The package produces labels for warehouse, stockroom, and other inventory tracking operations. The package's interactive user program lets users enter data to be coded for immediate printout of bar codes and block-lettered labels. A library of graphics routines is also provided that may be combined with applications programs written in PDP–11 Fortran–77, for fully automated label generation. Both parts of the package require that the RSX–11M system on which they run have Fortran–77 plus a minimum 40K words of memory.

The *Professional Tool Kit* lets programmers use PDP–11 RSX–11M and RSX–11M–Plus systems to develop applica-

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tion programs for Digital's Professional 300 Series Personal Computers. Using the software and optional hardware in the package, applications programmers can create and debug applications compatible with the Professional's P/OS menu-driven environment using their current PDP–11 system. The Tool Kit includes the Macro–11/Professional, Basic–Plus–2/Professional, and Fortran–77/Professional programming languages; the RMS/Professional Record Management System; FMS/Professional for forms-oriented video I/O management; the Sort/Professional record sorting utility; the Professional Graphics Package for over 20 device-independent graphics commands; the Professional Diskette Builder for end-user media distribution; and the Professional Debugger for use with Basic–Plus–2/Professional. Applications are developed on the host PDP–11 system and then transferred to a Professional 350 system for debugging.

ADE (Applications Development Environment) is a programming tool specifically designed for nonprogrammers to use in developing and running small, simple applications for use in small businesses. It allows users with little or no computer experience to perform record keeping and bookkeeping tasks such as maintaining and printing mailing lists, inventory lists, time sheets, and budgets. ADE runs in the RSTS/E timesharing environment.

ADE presents electronic worksheets made up of rows and columns on a user's video terminal. Users work with these worksheets by writing procedures—simple programs using English verbs. Procedures can store information from worksheets in tables kept in disk files, or retrieve such information; manipulate the entries in a worksheet; or print out reports. An interactive HELP command, continuous display of messages and available commands and messages at the bottom of the terminal screen, and interactive command prompting help users step by step.

Menu–11 is a software package that allows application programmers to design a customized interface between an RSTS/E system and its users. It allows for RSTS/E's DCL command language environment to be sealed off from novice or infrequent users and replaced with a set of interactive menus backed by help texts, giving users access to just those procedures and utilities needed in their work. Menu–11 consists of a set of programs that interact with RSTS/E and control the display of menus to users according to command files prepared by programmers. The command files specify the format and content of menus; help text associated with each menu option; actions to be taken when an option is chosen (including conditional execution of actions); transfers between different menus; and interactions with the user to gather more information. Menu options can execute system commands, run application programs, and generally perform actions or series of actions possible under RSTS/E.

PRICING

POLICY: DEC generally provides the PDP–11 minicomputers on a purchase basis, with separately priced maintenance agreements. DEC's Customer Finance Department enables customers to acquire a system using a lease, conditional sale, or similar financing agreement rather than outright purchase. CFD's function is to write full payout financing agreements for credit-worthy DEC customers who seek financing. Available are full payout leases with 3- to 5-year terms, noncancellable 3- to 5-year conditional sales agreements, and 3- to 5-year U.S. government lease to ownership agreements.

SUPPORT: Field service is offered on several levels to meet varying customer needs. For customers with in-house troubleshooting and self-maintenance capabilities, DEC offers the off-site facilities of its Product Repair Center (PRC), with locations throughout the world. On-site field service is offered worldwide through a network of offices with assigned service representatives. These offices provide both field service and spare parts inventory.

Per Call On Site Service is offered to customers for whom downtime may not be critical and who have sufficient expertise to perform first-line maintenance, or as a supplementary program for standard service agreement customers if remedial maintenance is required outside their normal hours of coverage. Labor rate charges are portal-to-portal; parts and travel expenses are rated separately.

The basic field service agreement includes remedial maintenance; preventive maintenance; an assigned service representative; all parts, material, and labor; engineering modifications; and documentation. Hours of coverage are 8 a.m. to 5 p.m. Monday through Friday. (Preventive maintenance time is extended by three hours to 8 p.m. on weekdays.) Extensions are available to allow coverage up to 24 hours a day, 7 days a week.

The DECservice agreement is also available. The DECservice agreement adds the following features to the basic field service agreement: response time of four hours or less if a call is made during coverage hours; continuous service until system-level repairs are complete; and no extra charge for service continued after coverage hours.

Software maintenance is offered through several levels of optional service, ranging from a periodic software newsletter to automatic updates of software and manuals (software subscription service). In addition, software components, including documents and updates, can be purchased separately from Digital's Software Distribution Center.

DEC offers a warranty policy and contract services for software products, including operating systems, programming languages, and utility packages. The services include a toll-free telephone support line for immediate response to questions on software usage and performance. Warranty services covering Digital-supported products include automatic delivery of Software Product Updates released during the 90-day warranty period and use of the Telephone Support Center for selected products. DEC also provides installation service, on-site support, technical newsletters, and a performance reporting service. Software product services extending beyond the warranty period range from comprehensive "DECsupport," which provides continuation of warranty-level support with visits for preventive maintenance, to a Software Product and Documentation Update service for self-maintenance customers. Service contracts carry monthly charges according to product and level of service.

DEC also sponsors the Digital Equipment Computer Users Society (DECUS), a voluntary, nonprofit users' group. DECUS provides an extensive program library, users' groups, special interest groups, and workshops/symposia. The society is responsible for maintaining the DECUS program library and publishing a library catalog, the proceedings of symposia, and a periodic newsletter.

TRAINING: Training credits are issued with many PDP–11 systems, allowing the customer to obtain free training in programming techniques and systems operation and applications. Training is offered in DEC facilities in the United States and worldwide. Digital also offers on-site instruction in both standard and customized courses and self-paced audio/visual (A/V) courses. DEC's Special Systems group offers training in both hardware and software areas on-site and in DEC training centers.

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TYPICAL CONFIGURATIONS: The following tables show typical PDP–11 configurations.

The following is a typical Micro/PDP–11 configuration:

11A23-F Micro/PDP-11 floor/table system base; includes CPU, 256KB parity MOS memory, RX50 800KB dual diskette drive	$ 7,300
RQDX1 Q–Bus disk controller	1,290
RD51-A 10MB Winchester disk drive	1,695
LA50-RA 50/100 cps dot matrix printer	695
Two VT240-A monochrome graphics terminals	3,960
Total Price	$14,940

The following is a typical PDP–11/24 configuration:

SX-FX200-EK(EN) PDP–11/24 System Building Block; includes CPU and power supply, 1MB ECC MOS memory, KT24 Physical Address Extension (PAX) module, CPU cabinet with power controller, EIA cable for console terminal, and PDP–11 operating system general license	$ 17,000
MS11-PB 1MB add-on memory module	4,900
KEF11-AA Floating point option	225
KEF11-BB Commercial instruction set	495
H775-A Battery backup unit	700
RUA81-AA RA81 456MB rack-mount fixed disk drive and UDA50 controller	24,000
DD11-CK expansion backplane	470
TU80-AA TU80 25/100 ips magnetic tape subsystem	9,900
LP11-AA LP25 300 lpm band printer	8,350
Eight VT240-A monochrome graphics terminals	15,840
DZ11-DP Eight-line multiplexer with I/O panel controller for EIA/CCITT terminals	2,175
Two LA50-RA 50/100 cps dot matrix printers	1,390
Total Price	$ 85,445

The following is a typical PDP–11/44 configuration:

SX-40200-EK(EN) PDP–11/44 System Building Block; includes CPU and power supply, 1MB ECC MOS memory, cabinet with power controller, I/O connection panel, EIA cable for console terminal, and PDP–11 operating system general license	$ 34,800
Three MS11-PB 1MB add-on memory units	14,700
KT24 Physcial Address Extension (PAX) module	800
FP11-F Floating point processor	3,100
KE44-A Commercial instruction set	7,900
H7750-BA(BB) Battery backup unit	1,600
RUA81-AA RA81 456MB rack-mount fixed disk drive and UDA50 controller	24,000
RA81-EA Three 456MB RA81 fixed disk drives in cabinet	50,000
TU80-AA TU80 25/100 ips magnetic tape subsystem	9,900
DD11-CK Expansion backplane	470
DD11-DK Expansion backplane	940
LN01-CA 12 ppm laser printer	19,995
LXY22-CA LXY22 600 lpm graphics printer	15,800
Four LA50-RA 50/100 cps dot matrix printers	2,780
Four DZ11-DP Eight-line multiplexers with I/O connection panel insert for EIA/CCITT terminals	8,700
24 VT240-A monochrome graphics terminals	47,520
Eight VT241-AA color graphics terminals	23,840
Total price	$266,845

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.
PDP–11 SINGLE-BOARD PROCESSORS			
KDF11–AC	LSI–11/23 CPU with 64KB addressing ranges; 46 optional floating point instructions; two modules	$ 1,140	$ 22
KDF11–AA	LSI–11/23 CPU with Memory Management Unit (MMU); physical address range to 4MB	1,340	22
KDF11–BA	PDP–11/23–PLUS CPU with all KDF11–AA features; two serial lines; diagnostics; boot; program controlled line clock	1,690	39
KDF11–BE	KDF–BA with boot ROM for Micro/PDP–11	1,690	39
PDP–11 KERNEL COMPUTERS			
11A23–F	Micro/PDP–11, floor/table enclosure with CPU; 256KB parity MOS memory; and RX50 800KB dual diskette	$ 7,300	$ 78
11A23–R	Same as 11A23–F, but rack-mount enclosure	7,300	78
11T23–BK(BL)	PDP–11/23–PLUS system base. Includes 512KB parity MOS memory, two RL02 disks, and controller	19,950	248
11V23–BE(BJ)	PDP–11/23–PLUS system base. Includes 256KB parity MOS memory and one RX02 dual diskette subsystem (1MB)	13,000	132
11X24–FA(FB)	PDP–11/24, includes CPU and power supply; 1MB ECC MOS memory; KT24 Physical Address Extension (PAX) module; I/O connection panel; and H9642–EA (EB) cabinet with power controller	14,000	105
11X44–FA(FB)	PDP–11/44 system base. Includes CPU and power supply; 1MB ECC MOS memory; I/O connection panel; and H9642–EA(EB) cabinet with power controller	29,950	154
PDP–11 RACK-MOUNT COMPUTERS			
11/23–BC(BD)	PDP–11/23–PLUS with CPU; 256KB Parity MOS memory; two serial line units; line frequency clock; boot and diagnostic ROMs; nine-slot backplane (seven open slots)	$ 5,690	$ 82
11/23–BE(BF)	Same as 11/23–BC(BD), but with 512KB memory	6,690	109

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EQUIPMENT PRICES (Continued)

		Purchase Price	Monthly Maint.
11/23–SC(SD)	PDP–11/23–S. Includes CPU; 32KB CMOS memory; two serial line units; line frequency clock; 18-bit addressing; I/O connection panel with removable templates	4,230	68
11/23–SE(SF)	Same as 11/23–SC(SD), but with 64KB NMOS memory	3,740	78
11/24–CC(CD)	PDP–11/24. Includes CPU and power supply; 1MB ECC MOS memory; KT24 Physical Address Extension (PAX) module; 5.25-in. (13.3-cm.) box	11,000	95
11/24–DC(DD)	PDP–11/24. Includes CPU and power supply; 1MB ECC MOS memory; KT24 PAX module; 10.5-inch (26.6-cm.) box	12,500	105
11/44–DA(DB)	PDP–11/44. Includes CPU and power supply; 1MB ECC MOS memory; 10.5-inch (26.6-cm.) box	29,300	164
MICRO/PDP–11 SYSTEMS			
SX–RA500–EX	Micro/PDP–11 floor/table packaged system. Includes CPU; 256KB Parity MOS memory; RX50 800KB dual diskette; RD51 10MB Winchester disk; DZV11 multiplexer; six terminal ports; and operating system general license	$10,125	$109
SX–RA500–FA	Same as SX–RA500–EX, but includes a BQ01–AA country kit (USA and English-speaking Canada)	10,225	109
PDP–11/23–PLUS SYSTEMS			
SX–RXMMA–EK(EN)	PDP–11/23–PLUS packaged system. Includes CPU; 512KB Parity MOS memory; two RL02 10.4MB cartridge disk drives and controller; and operating system general license	$20,750	$248
PDP–11/24 SYSTEMS			
SX–FXGMB–EK(EN)	PDP–11/24 packaged system. Includes CPU; 1MB ECC MOS memory; 121MB RA80 disk drive and UDA50 controller; one 10.4MB RL02 cartridge disk drive and controller; H9645–EA(EB) cabinet with power controller; EIA cable for console terminal; I/O connection panel; and operating system general license	$42,000	$287
SX–FXMMB–EK(EN)	PDP–11/24 packaged system. Includes CPU and power supply; 1MB ECC MOS memory; KT24 PAX module; H9645–EA(EB) cabinet with power controller; two RL02 10.4MB cartridge disk drives and controller; EIA cable for console terminal; I/O connection panel; and operating system general license	26,900	$239
PDP–11/44 SYSTEMS			
SX–40GMB–EK(EN)	PDP–11/44 packaged system. Includes CPU and power supply; 1MB ECC MOS memory; nine-slot expansion backplane; 121MB RA80 disk drive and UDA50 controller; RL02 10.4MB cartridge disk drive and controller; EIA cable for console terminal; H9545–EA(EB) cabinet with power controller; I/O connection panel; and operating system general license	$60,300	$346
SX–40MMB–EK(EN)	PDP–11/44 packaged system; includes CPU and power supply; 1MB ECC MOS memory; two RL02 10.4MB cartridge disk drives and controller; EIA cable for console terminal; I/O connection panel; H9645–EA(EB) cabinet with power controller; operating system general license	44,700	298
SYSTEM BUILDING BLOCKS			
SX–FX100–EK(EN)	PDP–11/24 System Building Block. Includes CPU and power supply; 1MB ECC MOS memory; KT24 PAX module; I/O connection panel; EIA cable for console terminal; H9642–EA(EB) CPU cabinet with power controller; operating system general license	$16,000	$105
SX–FX200–EK(EN)	Same as SX–FX100–EK(EN), but with wide H9645–EA(EB) cabinet	17,000	105
SX–40100–EK(EN)	PDP–11/44 System Building Block. Includes CPU and power supply; 1MB ECC MOS memory; I/O connection panel; EIA cable for console terminal; H9642–EA(EB) cabinet with power controller; and operating system general license	33,000	154
SX–40200–EK(EN)	Same as SX–40100–EK(EN), but with wide H9645–EA(EB) cabinet	34,800	164

PROCESSOR OPTIONS

MICRO/PDP–11, PDP–11/23–PLUS, and PDP–11/23–S Processor Options

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
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	2,000	25
KEF11–BB	Commercial Instruction Set (CIS); implements a set of 27 commercial instructions on a variety of data types, including character strings, packed decimal and numeric formats	495	NA
MCV11–DA	8KB MOS static Random Access Memory with on-board battery backup	1,250	28
MCV11–DC	32KB CMOS static Random Access Memory with on-board battery backup	990	18
MSV11–LF	128KB MOS memory	1,000	15
MSV11–LK	256KB MOS memory	1,250	28
MSV11–PK	256KB parity MOS memory	1,250	28
MSV11–PL	512KB parity MOS memory	2,000	55

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EQUIPMENT PRICES (Continued)

		Purchase Price	Monthly Maint.
PDP–11/24 Processor Options			
KEF11–AA	Single- and double-precision floating point; operates on 32-bit and 64-bit floating point numbers; mounts on CPU board	$ 225	NC
FPF11	Single- and double-precision floating point; performs hardware operations on 32-bit and 64-bit floating point numbers; microcode resides on one quad module adjacent to CPU	2,000	25
KEF11–BB	Commercial Instruction Set (CIS) for the PDP–11/24; implements a set of 27 commercial instructions on a variety of data types, including character strings, packed decimal and numeric formats	495	NA
MS11–PB	1MB ECC MOS memory	4,900	46
KT24	Physical Address Extension (PAX) module allows memory expansion up to 4MB with a 5.25-inch CPU box and up to 1MB with a 10.5-inch CPU box; must mount in second hex slot in CPU backplane next to the processor	800	16
H775–A	Battery backup for 5.25-inch PDP–11/24 CPU	700	8
H7750–BA(BD)	Battery backup for 10.5-inch PDP–11/24 CPU	1,600	16
PDP–11/44 Processor Options			
KE44–A	Commercial Instruction Set (CIS) processor for the PDP–11/44; implements a set of 27 commercial instructions on a variety of data types, including character strings, packed decimal and numeric formats	$ 7,900	$ 18
FP11-F	Floating point processor for PDP–11/44; 46 floating-point instruction set; performs hardware operations on 32-bit and 64-bit floating point numbers; mounts in dedicated slot in PDP–11/44 backplane	3,100	18
MS11–PB	1MB ECC MOS memory; backwards compatible with MS11–MB memory	4,900	46
H7750–BA(BD)	Battery backup for PDP–11/44 CPU	1,600	16
MASS STORAGE			
RUA80–AA(AD)	RA80 fixed disk subsystem; includes 121MB drive (no cabinet) and UDA50 controller	$19,000	$111
RUA80–CA(CD)	RA80 fixed disk subsystem with 121MB storage; contains RA80 cabinet-mounted disk drive and UDA50 controller	21,000	111
RUA80–JA(JD)	RA80 fixed disk subsystem; includes cabinet-mounted 121MB drive and two UDA50 controllers	26,000	141
RA80–AA(AD)	RA80 rack-mounted 121MB disk drive (no cabinet); requires UDA50 controller	14,000	81
RA80–CA(CD)	RA80 cabinet-mounted add-on 121MB fixed disk drive; requires UDA50 controller	16,000	81
RUA81–AA(AD)	RA81 fixed disk subsystem; includes rack-mounted 456MB drive (no cabinet) and UDA50 controller	24,000	120
RUA81–CA(CD)	RA81 fixed disk subsystem; includes 456MB cabinet-mounted drive and UDA50 controller	26,000	120
RUA81–EA(ED)	RA81 fixed disk subsystem; includes three 456MB cabinet-mounted drives and UDA50 controller	55,000	300
RUA81–JA(JD)	RA81 fixed disk subsystem; includes one 456MB cabinet-mounted drive and two UDA50 controllers	31,000	150
RA81–AA(AD)	RA81 rack-mounted disk drive (no cabinet); requires UDA50 controller	19,000	90
RA81–CA(CD)	RA81 cabinet-mounted disk drive; requires UDA50 controller	21,000	90
RA81–EA(ED)	Three cabinet-mounted RA81 drives; requires UDA50 controller	50,000	270
RUA60–AA	RA60 removable disk subsystem; includes 205MB drive (no cabinet) and UDA50 controller	20,000	110
RUA60–CA(CD)	RA60 removable disk subsystem; includes 205MB cabinet-mounted drive and UDA50 controller	22,000	110
RUA60–JA(JD)	Same as RUA60–CA(CD) except with two UDA50 controllers	27,000	140
RA60–AA	RA60 rack-mounted disk drive (no cabinet); requires H9642–AP(AR) cabinet and UDA50 controller	15,000	80
RA60–CA(CD)	RA60 cabinet-mounted disk drive; requires UDA50 controller	17,000	80
RUA80–UA(UD)	UDA50 add-on controller for dual-porting RA81, RA80, and RA60 disks	5,000	30
RL211–AK	RL02 cartridge disk subsystem; includes rack-mounted, top-loading 10.4MB cartridge disk drive and controller to interface to the PDP–11 Unibus	6,900	71
RLV22–AP	RL02 cartridge disk subsystem; same as RL211–AK, except controller interfaces to the Q–Bus on Micro–PDP–11, PDP–11/23–PLUS and PDP–11/23–S systems	6,900	73
RL02–AK	Add-on cartridge disk; requires RL211–AK	3,000	63
RLV12–AP	RLV12 controller; interfaces 1-4 RL02 drives to the Q–Bus. System option; includes module, internal cables, and I/O connector panel insert. Option must be ordered with the system in which it will be installed.	3,900	13
CK–RLV1A–KA	Cabinet kit for Micro/PDP–11 box	100	—
CK–RLV1A–KB	Cabinet kit for PDP–11/23–S box	100	—
CK–RLV1A–KC	Cabinet kit for PDP–11/23–PLUS panel	100	—
RLV22–AK	Upgrade option for the Q–Bus; requires either CK–RLV1A–KA, –KB, or –KC cabinet kit	6,800	73
RD51–A	RD51 5¼-inch, 10MB Winchester disk drive; intended for addition to Micro/PDP–11 system enclosure	1,695	7
RD51–D	RD51 10MB Winchester drive in desktop enclosure; includes I/O cable	2,295	18
RD51–R	RD51 rack-mounted 10MB Winchester drive; requires H9302 enclosure	2,295	18
H9302	Rack-mount chassis for up to two RD51 or RX50 drives	165	N/C
RX211–BK(BM,BN)	RX02 dual floppy disk subsystem; includes two 0.5MB RX02 drives and controller to interface to PDP–11 Unibus; rack-mount	4,150	50
RXV21–EP(ES,ET)	RX02 tabletop dual floppy disk subsystem; includes two 0.5MB RX02 drives and controller to interface to the Q–Bus on Micro/PDP–11, PDP–11/23–PLUS and PDP–11/23S systems	4,500	50
RXV21–EA(ED,EC)	Upgrade option for the Q–Bus. Requires one of the following cabinet kits:	4,430	50
CK–RXV2E–KA	Cabinet kit for Micro/PDP–11 box	70	—
CK–RXV2E–KB	Cabinet kit for PDP–11/23–S box	70	—
CK–RXV2E–KC	Cabinet kit for PDP–11/23–PLUS box	70	—

DEC PDP–11 Family

EQUIPMENT PRICES (Continued)

		Purchase Price	Monthly Maint.
➤RX50–AA	RX50 0.8MB diskette drive; intended for addition to Micro/PDP–11 system enclosure	700	8
RX50–D	RX50 0.8MB diskette drive in desktop enclosure; includes I/O cable	1,300	20
RX50–R	RX50 0.8MB rack-mounted diskette drive; requires H9302 enclosure	1,300	20
RQDX1	Q–Bus controller for RX50/RD51	1,290	12
CK–RQDX1–KA	Cabinet kit for the RQDX1 for Micro/PDP–11 box	50	—
CK–RQDX1–KC	Cabinet kit for RQDX1 for PDP–11/23–PLUS panel	50	—
RQDX1–E	Double-height disk drive bus extender module for use with the RQDX1 controller	150	—
CK–RQDXE–KA	Cabinet kit for the RQDX1–E for the Micro/PDP–11 box	50	—
CK–RQDXE–KC	Cabinet kit for the RQDX1–E for the PDP–11/23 panel	50	—
CARTRIDGE TAPE			
TU58–DA	TU58 cabinet-mountable dual drive cartridge tape subsystem including the necessary hardware for mounting in standard cabinetry; 800 bpi record density; 30 ips read/write speed; 262KB capacity per cartridge	$ 1,850	$ 17
TU58–EB	Same as TU58–DA except tabletop version	1,750	17
TU58–K	One 256KB TU58 data cartridge for the TU58–DA and TU58–EB	23	—
MAGNETIC TAPE			
TJE11–AA(AD)	TE16 magnetic transport and controller to interface with the PDP–11 UNIBUS; includes the controller, a tape formatter, and one nine track TE16 tape transport; 1600 bpi and 800 bpi record densities; 45 ips read/write speed; mounted in 60-inch H9602 cabinet	$27,000	$163
TE16–AE(AJ)	TE16 magnetic tape transport; requires TJE16	15,900	97
TJU77–AB(AD)	TU77 magnetic tape transport and controller to interface to the PDP–11 Unibus: includes the controller, a tape formatter and one nine-track TU77 tape transport; 1600 bpi and 800 bpi record densities; 125 ips read/write speed	36,800	259
TU77–AF(AJ)	TU77 magnetic tape transport; requires TJU77	23,800	193
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	9,900	63
TSV05–BA(BB, BC, BD)	TSV05 magnetic tape subsystem mounted in a 40-inch H9642 cabinet; microprocessor based one-half inch magnetic tape subsystem incorporates reel-tape technology; 1600 bpi; 25 ips read/write speed; requires a Micro/PDP–11 or any PDP–11/23-based system	9,995	85
TSV05–AA(AB, AC, AD)	TSV05 magnetic tape subsystem with hardware for rack-mounting, control module, and cables	8,900	85
TERMINALS			
VT220–A	VT220 video terminal with white phosphor nonglare screen	$ 1,080	$ 6
VT220–B	VT220 video terminal with green phosphor nonglare screen	1,080	6
VT220–C	VT220 video terminal with amber phosphor nonglare screen	1,080	6
VT240–A	Monochrome graphics terminal with white phosphor nonglare screen	1,980	16
VT240–B	Monochrome graphics terminal with green phosphor nonglare screen	1,980	16
VT240–C	Monochrome graphics terminal with amber phosphor nonglare screen	1,980	16
VT241–AA	Color graphics terminal for USA and English-speaking Canada	2,980	23
VT24X–AA	VT240/241 300/1200 integral modem	495	6
BCC02–02	2-foot cable for connecting VT240 series monochrome monitor to system box	25	—
BCC02–06	6-foot cable for connecting VT240 series monochrome monitor to system box	35	—
BCC03–06	6-foot cable for connecting VT240 series color monitor to system box	35	—
BCC04–10	10-foot EIA cable for connecting a VT200 terminal to a modem	30	—
BCC05–10	10-foot EIA cable for connecting a VT200 terminal to a printer	30	—
BC05F–15	15-foot 20 mA cable for connecting a VT200 terminal to the host	35	—
BC22D–25	25-foot EIA null modem cable for connecting a VT200 terminal to the host	48	—
VT100–AA(AB)	VT100 tabletop video display terminal; operates on full duplex asynchronous communications lines, and is equipped with a standard EIA interface; 50 to 19,200 bps baud rate; 24 lines x 80 characters or 14 lines x 132 characters (selectable); 7 x 9 dot matrix, 2-dot descenders; 94-character ASCII and 32 special graphic features	1,945	18
VT100–WA(WB)	VT100 terminal with advanced video, word processing keyboard, and US power cord and plug	2,140	22
VT101–AA(AB)	VT101 tabletop video display terminal; operates on full-duplex, asynchronous communications lines and is equipped with a standard EIA interface; 50 to 19,200 bps baud rate; 24 lines x 80 characters ASCII set with 32 special graphic characters; 83-key detachable unit; standard numeric/function keypad	1,350	15
VT102–AA(AB)	VT102 tabletop video terminal; 50 to 19,200 bps baud rate; 24 lines x 80 characters or 132 characters; 7 x 10 dot matrix with 2 dot descenders; 94-character ASCII set with 32 special graphics characters; U.S. and British character sets standard, others optional; normal or reverse video, blinking, underline, and bold characters on a character-by-character basis; standard numeric/function keypad	1,595	22
VT102–WA(WB)	Same as VT102–AA(AB), but with word processing keyboard included	1,595	22
VT125–AA(AB)	VT125 tabletop graphics terminal operating with EIA/CCITT Interface; 50 to 19,200 bps baud rates; even, odd or none (keyboard selectable parity); 768 x 240 pixel graphics resolution; printer port for graphics mode (for use with LA34–VA); 24 lines x 80 characters or 14 lines x 132 characters; 7 x 10 dot matrix with descenders; 96-ASCII character set (upper-/lowercase, numeric and punctuation) with 32-character special graphics set, split screen capability	3,800	29
VT125–WA(WB)	Same as VT125–AA(AB), but with advanced video capability and word processing keyboard	3,995	32
VT131–AA(AB)	VT131 video terminal with full VT102 capability plus local editing and block mode transmission	1,695	23

DEC PDP–11 Family

EQUIPMENT PRICES (Continued)

		Purchase Price	Monthly Maint.
RT100–AA(AB)	RT100 ruggedized video terminal for industrial environments; includes sheet-steel case, filtration system, hinged keyboard, and EIA interface	4,300	30
RT100–BA(BB)	Same as RT100–AA(AB), but with 20 mA interface	4,300	30
RT102–AA(AB)	RT102 ruggedized video terminal for industrial environments; includes EIA interface	4,300	300
RT102–BA(BB)	Same as RT102 AA(AB), but with 20 mA interface	4,300	30
RT137–AA	RT137 bar code terminal; includes RT100 video terminal with bar code reader, bar code keyboard, VT100 keyboard, light pen, and EIA interface	5,625	45
RT137–BA	Same as RT137–AA, but with 20 mA interface	5,625	45
VS11–FA	VS11 Unibus systems color raster graphics display station	4,725	62
VS11–FC(FD)	Same as VS11–FA, but includes second frame buffer	5,645	79
VT1XX–AA	20 mA adapter for the VT100; allows VT100 terminal to convert from an EIA interface to a 20 mA current loop interface	140	4
VT1XX–AB	Advanced video option for the VT100/VT125	180	4
VT1XX–AC	Printer port option; allows connection of a VT100 to a hardcopy printer	350	7
VT1XX–CA	20 mA interface adapter option for VT100/VT101/VT102/VT125/VT131	140	4
VT1XX–CB	Graphics upgrade kit for VT100 to VT125 graphics functionality	1,800	11
VT1XX–CE	Word processing upgrade kit for VT100 and VT125	395	—
LA12–AB	LA12 DECwriter Correspondent hardcopy terminal with integral 1200-baud dial-through-keyboard modem, 300 baud coupler, EIA interface and carrying case	2,195	21
LA12–CB	LA12 hardcopy terminal with integral 300 baud coupler, EIA interface, and carrying case	1,595	21
LA12–D	LA12 hardcopy terminal with RS–232–C interface and accessories, 100-ft. paper roll, ribbon cartridge instruction card, loop-back connector, and line cord	1,445	21
LA100–BA	LA100 Letterwriter 100 keyboard send/receive hardcopy terminal with keypad, tractors, cable, ribbon cartridge, roll of paper, Courier 10/Orator 10 fonts in US/UK character sets	2,195	27
LA100–BB	Same as LA100–BA, but includes VT100 line drawing set	2,195	27
LA100–CA	Same as LA100–BB, but includes multiple font option	2,295	27
LA120–DA	LA120 DECwriter keyboard send/receive hardcopy terminal	2,800	32
PRINTERS			
LA50–RA	LA50 tabletop printer (50/100 cps) with tractor feed, 110 VAC power supply	$ 695	$ 8
LA50–RB/RC	LA50 tabletop printer (50/100 cps) with tractor feed, 220/240 VAC power supply	715	8
LA100–ZA	LA100 Letterprinter/100 receive-only printer (30/80/240 cps) with keypad, tractors, cable, ribbon cartridge, roll of paper, and Courier 10/Orator 10 fonts in US/UK character sets	1,595	28
LA100–ZB	Same as LA100–ZA, but with international overlay, VT100 drawing set, and only Courier 10 font	1,595	28
LA120–RA	LA120 DECprinter III (180 cps) receive-only printer; for use with 1-/6-part forms	2,420	37
LA120–RB	Same as LA120–RA, but for use with 4-/9-part forms	2,600	37
LN01–CA(CB)	High-quality nonimpact laser printer; 12 pages per minute printing speed; 188 character set; portrait and landscape print modes; LP11 interface and cable included	19,995	320
LN01–DA(DB)	LN01 nonimpact 12 ppm laser printer with DMF 32-compatible cable	19,995	320
LP11–AA	LP25 band printer; 300 lpm for 64 ASCII character set; for Unibus systems	8,350	100
LP11–BA	LP25 band printer; 300 lpm for 64 ASCII set or 215 lpm for 96 ASCII character set; for Unibus systems	8,950	100
LPV11–AP	LP25 Q–Bus systems band printer; 300 lpm for 64-character set	8,350	100
LPV11–BP	LP25 Q–Bus systems band printer; 300 lpm for 64-character set or 215 lpm for 96-character set	8,950	100
LP11–EA	LP26 Unibus systems band printer; 600 lpm for 64-character set	13,600	143
LP11–EB	LP26 Unibus systems band printer; 600 lpm for 64-character set or 445 lpm for 96-character set	14,400	143
LQP02–AA(AD)	LQP02 32 cps letter-quality printer with Courier–10 font	2,800	29
LQPX2–AA	Bidirectional forms tractor option for fanfold paper	250	—
LQPX2–SF	Dual-tray cutsheet feeder with envelope tray	1,800	17
LPV11–EP	LP26 Q–Bus systems band printer; 600 lpm for 64-character set	13,600	150
LPV11–FP	LP26 Q–Bus systems band printer; 600 lpm for 64-character set or 445 lpm for 96-character set	14,400	150
LP27–UA(UB)	LP27 Unibus systems band printer (1200 lpm) with 30-foot data cable and controller	28,990	247
LXY12–CA(CB)	LXY12 Unibus systems 300 lpm dot matrix graphics printer with 30-foot cable, pedestal with basket, paper guide, and LP11 controller	11,250	99
LXY12–DA(DB)	Same components as LXY12–CA(CB), but with RS–232–C serial port instead of controller	11,250	99
LXY22–CA(CB)	LXY22 Unibus systems 600 lpm dot-matrix printer graphics with 30-foot cable, pedestal with basket, paper guide, and LP11 controller	15,800	129
LXY22–DA(DB)	Same components as LXY22–CA(CB), but with RS–232–C serial port instead of LP11 controller	15,800	129
CABINETS AND EXPANSION HARDWARE			
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	$ 2,000	—
H9642–BD(BE)	Top-loading expansion cabinet for RL02 cartridge disk drive	1,570	—
H9642–EA(EB)	CPU cabinet for PDP–11/24 and PDP–11/44; includes I/O connection panel and accommodates 10.5- or 5.25-inch CPU, battery backup unit and one of the following storage devices; TU58–DA, RL211–AK, RUA80–AA(AD), RUA81–AA(AD), or RX211–BK(BN)	2,200	—
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	—
H9642–FC(FD)	Unpartitioned expander cabinet for a BA11–KU(KV) Unibus expander box and two I/O connection panels	2,050	—

DEC PDP–11 Family

EQUIPMENT PRICES (Continued)

		Purchase Price	Monthly Maint.
H9645–EA(EB)	Wide CPU cabinet for PDP–11/24 and PDP–11/44; provides mounting space for a 10.5-inch CPU and two of the storage devices applicable to H9842–EA(EB); includes I/O connection panel and side mounting for battery backup unit	2,500	—
BA11–KU(KV)	Unibus expansion box; cabinet-mountable expander box with bezel and slides for use in H9642–FA(FB) and –FC(FD) expander cabinets	3,500	20
BA11–SE(SF)	Extended Q–Bus expansion box; cabinet-mountable expander box with bezel required for 22-bit expansion or use in PDP–11/23–PLUS system	2,000	15
DD11–CK	Four-slot expansion backplane for use in BA11–KU(KV) expander boxes; also mounts in PDP–11/24 and PDP–11/44 CPU boxes; accommodates seven hex and two quad modules	470	—
DD11–DK	Nine-slot expansion backplane for use in BA11–KU(KV) expander boxes; also mounts in PDP–11/24 and PDP–11/44 CPU boxes; accommodates seven hex and two quad modules	940	—

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

DHV11	Eight-line asynchronous communications interface; quad-sized module; operating speeds from 50 to 19.2K bps	$ —	$ —
DHV11–AP	DHV11 system option	1,350	14
DHV11–M	DHV11 upgrade option; includes base module only; requires an appropriate cabinet kit	1,200	14
DLVE1	Asynchronous, RS–232–C, one-line interface; dual-sized module; operating speeds from 50 to 19.2K bps	—	—
DLVE1–DP	DLVE1 system option	550	8
DLVE1–M	DLVE1 upgrade option. Includes base module only; requires one of the following cable kits:	440	8
CK–DLVE1–DR	DLVE1 cabinet kit for use with PDP–11/23–S box	110	—
CK–DLVE1–DB	DLVE1 cabinet kit for use with Micro/PDP–11 box	110	—
CK–DLVE1–DC	DLVE1 cabinet kit for use with PDP–11/23–PLUS box	110	—
CK–DLVE1–D3	DLVE1 cabinet kit for use with CPUs without I/O connection panels	110	—
DLVJ1	Four line EIA/CCITT asynchronous interface with modem control; dual-size, double-buffered module; line speeds from 150 to 38.4K bps	—	—
DLVJ1–LP	DLVJ1 system option	650	12
DLVJ1–M	DLVJ1 upgrade option. Includes base module only; requires external cables and one of the following cable kits:	580	—
CK–DLVJ1–LA	DLVJ1 cabinet kit for use with PDP–11/23–S box	70	—
CK–DLVJ1–LB	DLVJ1 cabinet kit for use with Micro/PDP–11 box	70	—
CK–DLVJ1–LC	DLVJ1 cabinet kit for use with PDP–11/23–PLUS panel	70	—
DZV11	Four-line asynchronous, program-controlled multiplexer with modem control on all lines; quad-size module; operating speeds to 9600 bps	—	—
DZV11-DP	DZV11 system option	900	11
DZV11–M	DZV11 upgrade option. Includes base module only; requires selection of external cables and one of the following cabinet kits:	720	11
CK–DZV11–DA	DZV11 cabinet kit for use with PDP–11/23–S box	180	—
CK–DZV11–DB	DZV11 cabinet kit for use with Micro/PDP–11 box	180	—
CK–DZV11–DC	DZV11 cabinet kit for use with PDP–11/23–PLUS panel	180	—
CK–DZV11–D3	DZV11 cabinet kit for use with CPUs without I/O connection panels	180	—

Synchronous Interfaces

DEQNA	DECnet option that connects Q–Bus systems to DECnet Ethernet local area network (LAN); operater at 10M bps; requires transceiver cables and H4000 transceiver or DELNI to connect to Ethernet	$ —	$ —
DEQNA–KP	DEQNA system option	1,150	—
DEQNA–M	DEQNA upgrade option. Includes base module only; requires external cables and one of the following cabinet kits:	1,000	—
CK–DEQNA–KA	DEQNA cabinet kit for use with PDP–11/23–S box	150	—
CK–DEQNA–KB	DEQNA cabinet kit for use with Micro/PDP–11 box	150	—
CK–DEQNA–KC	DEQNA cabinet kit you use with PDP–11/23–PLUS panel	150	—

DEC PDP–11 Family

EQUIPMENT PRICES (Continued)

		Purchase Price	Monthly Maint.
DUV11	Single-line, double-buffered, program-controlled communications interface used to establish a data communications link between any Q–Bus system and a Bell 201 synchronous modem or equivalent; fully programmable with respect to sync characters and parity selection; provides serial-to-parallel and parallel-to-serial data communications, buffers TTL-EIA voltage levels, and controls modem for half- or full-duplex operation; also interfaces synchronous and isochronous communications data; transmits EIA/CCITT data at rates up to 9600 bps	—	—
DUV11–AP	DUV11 system option	990	8
DUV11–M	DUV11 upgrade option; requires selection of one of the following cabinet kits:	790	8
CK–DUV11–AA	DUV11 cabinet kit; for use with PDP–11/23–S box	200	—
CK–DUV11–AB	DUV11 cabinet kit for use with Micro/PDP–11 box	200	—
CK–DUV11–AC	DUV11 cabinet kit for use with PDP–11/23–PLUS panel	200	—
CK–DUV11–A3	DUV11 cabinet kit for use with CPUs without I/O connection panels	200	—
DPV11	Single-line, program-controlled, double-buffered communications device interfaces a Q–Bus system to a serial synchronous line; suited for interfacing to medium-speed synchronous lines for packet switching, remote batch, remote data collection, remote concentration and network application; capable of handling, under program control, a wide variety of protocols, including byte-oriented protocols such as DDMP and Bisync and bit-oriented protocols such as HDLC and ADCCP	—	—
DPV11–AP	DPV11 system option	770	13
DPV11–M	DPV11 upgrade option; requires one of the following cabinet kits:	550	13
CK–DPV11–AA	DPV11 cabinet kit for use with PDP–11/23–S box	220	—
CK–DPV11–AB	DPV11 cabinet kit for use with Micro/PDP–11 box	220	—
CK–DPV11–AC	DPV11 cabinet kit for use with PDP–11/23–PLUS panel	220	—
CK–DPV11–A3	DPV11 cabinet kit for use with CPUs without I/O connection panels	220	—
DMV11	Multipoint, multidrop intelligent microprocessor-bases synchronous line controller supports full- or half-duplex Direct Memory Access (DMA) data transfer in either point-to-point or multipoint operation; depending on operating system and layered software implementation, will support up to 12 multipoint tributaries; controller microcode handles all DDCMP protocol processing, thereby offloading the central processor	—	—
DMV11–AP	DMV11 system option; RS–232–C/CCITT V.28 interface; requires external cable	2,200	39
DMV11–BP	DMV11 system option; CCITT V.35/DDS interface; includes cable for connection to modem	2,300	39
DMV11–CP	DMV11 system option; integral modem; requires external cable	2,000	39
DMV11–FP	DMV11 system option; RS–423–A/CCITT V.24 interface; requires external cable	2,300	39
DMV11–M	DMV11 upgrade option; RS–232–C or RS–423/RS–449 interface; includes base module only; requires selection of external cables and one of the following cabinet kits:	1,930	39
CK–DMV11–AA	RS–232–C cabinet kit for use with PDP–11/23–S box	270	—
CK–DMV11–AB	RS–232–C cabinet kit for use with Micro/PDP–11 box	270	—
CK–DMV11–AC	RS–232–C cabinet kit for use with PDP–11/23–PLUS panel	270	—
CK–DMV11–A3	RS–232–C cabinet kit for use with CPUs without I/O connection panels	270	—
CK–DMV11–FA	RS–423/RS–449 cabinet kit for use with PDP–11/23–S box	270	—
CK–DMV11–FB	RS–423/RS–449 cabinet kit for use with Micro/PDP–11 box	270	—
CK–DMV11–FC	RS–423/RS–449 cabinet kit for use with PDP–11/23–PLUS panel	270	—
CK–DMV11–F3	RS–423/RS–449 cabinet kit for use with CPUs without I/O connection panels	270	—
DMV11–N	DMV11 upgrade option; V.35 and integral modem interfaces; requires selection of external cables and one of the following cabinet kits:		
CK–DMV11–BA	V.35 cabinet kit for use with PDP–11/23–S box; includes cable for connection to modem	740	—
CK–DMV11–BB	V.35 cabinet kit for use with Micro/PDP–11 box; includes cable for connection to modem	740	—
CK–DMV11–BC	V.35 cabinet kit for use with PDP–11/23–PLUS panel; includes cable for connection to modem	740	—
CK–DMV11–B3	V.35 cabinet kit for use with CPUs without I/O connection panels; contains a 25-foot cable to connect the DMV11–N module to the option	740	—
CK–DMV11–CA	Integral modem cabinet kit for use with PDP–11/23–S box	440	—
CK–DVM11–CB	Integral modem cabinet kit for use with Micro/PDP–11 box	440	—
CK–DMV11–CC	Integral modem kit for use with PDP–11/23–PLUS panel	440	—
CK–DMV11–C3	Integral modem kit for use with CPUs without I/O connection panels; contains a 25-foot cable that attaches the DMV11 module to the option	440	—
KMV11	Single-line synchronous/asynchronous programmable communications interface	—	—
KMV11–AA	Supports RS–232–C or CCITT V.28 operation at 19.2K bps; for use on PDP–11/23–PLUS systems; external cable not included	2,500	28
KMV11–AE	Supports RS–449/RS–422–A or CCITT V.11 operation to 64K bps; for use on PDP–11/23–PLUS systems; external cable not available from Digital	2,700	28
KMV11–AF	Supports RS–449/RS–422–A or CCITT V.10 operation to 19.2K bps; for use on PDP–11/23–PLUS systems; external cable not available from Digital	2,500	28

DEC PDP–11 Family

EQUIPMENT PRICES (Continued)

UNIBUS COMMUNICATION 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.

		Purchase Price	Monthly Maint.
Single-Line Asynchronous Interfaces			
DL11	DL11 single-line asynchronous interfaces provide local and remote intercommunication of the Unibus to terminals and other computer systems; selectable character size, parity stop bit(s), and speed of operation; operate in full-duplex or half-duplex mode	$ —	$ —
DL11–AP	DL11 system option; EIA/CCITT serial line interface with modem control, jumper selectable options; compatible with Bell 103, 113, or 202 modem; data rates from 50-9600 bps; cable included	1,170	8
DL11–HP	DL11 system option; 20 mA serial line interface and line frequency realtime clock; switch-selectable options; data rates from 110-9600 bps; character formats are switch-selectable; cable for terminal connection is included	990	7
DL11–DP	DL11 system option; EIA/CCITT RS–232–C serial line interface and line frequency realtime switch-selectable options; includes BCO5C–25 cable; data rates from 110-9600 bps; character formats are switch-selectable	950	7
DL11–M	DL11 upgrade option; RS–232–C interface and modem control. Includes base module only; requires one of the following cabinet kits:	770	8
CK–DL11–AD	DL11 cabinet kit for use with PDP–11/24 and –11/44 shielded cabinets	400	—
CK–DL11–A1	DL11 cabinet kit for use with unshielded PDP–11/24 or –11/44 models; adapter bracket included	400	—
DL11–N	DL11 upgrade option; RS–232–C and 20 mA interfaces. Includes base module only; requires one of the following cabinet kits:	760	7
CK–DL11–DD	RS–232–C cabinet kit you use with PDP–11/24 and –11/44 shielded cabinets	230	—
CK–DL11–D1	RS–232–C cabinet kit for use with unshielded cabinet models	230	—
CK–DL11–HD	20 mA cabinet kit for use with PDP–11/24 and –11/44 shielded cabinets	180	—
CK–DL11–H1	20 mA cabinet kit for use with unshielded cabinet models; adapter bracket included	180	—
Asynchronous Multiplexers			
DZ11	Asynchronous serial communications interfaces can be used for local or remote connection of Unibus systems for up to 8 terminals or to another system; programmable speeds up to 9600 bps and format on a per-line basis, operating at full-duplex	$ —	$ —
DZ11–DP	DZ11 system option; eight-line multiplexer for EIA/CCITT terminals; can be expanded to 16 lines; includes modem control; cable not included	2,175	33
DZ11–HP	DZ11 system option; eight-line multiplexer for 20 mA current loop terminal; can be expanded to 16 lines; cable not included	2,500	33
DZ11–M	DZ11 upgrade option; RS–232–C interface. Includes base module only; requires one of the following cabinet kits:	1,560	33
CK–DZ11–DD	RS–232–C cabinet kit; for use with PDP–11/24 and –11/44 shielded cabinets	615	—
CK–DZ11–D1	RS–232–C cabinet kit; for use with unshielded cabinet models adapter bracket included	615	—
DZ11–N	DZ11 upgrade option; 20 mA interface. Includes base module only; requires one of the following cabinet kits:	1,635	33
CK–DZ11–HD	20 mA cabinet kit for PDP–11/24 and –11/44 shielded cabinets	865	—
CK–DZ11–H1	20 mA cabinet kit for unshielded cabinet models; adapter bracket included	865	—
DH11	16-line asynchronous DMA multiplexers for local or remote connection of Unibus to EIA/CCITT terminals; operating in full- or half-duplex mode; they support per-line program control for data rates up to 9600 bps, character size, stop bit, and transmission mode; split-speed transmit and receive rates are supported	—	—
DH11–AP	DH11 system option; includes modem control; cables not included	8,950	68
DH11–DP	DH11 system option; does not include modem control; cables not included	7,950	57
DH11–M	DH11 upgrade option; RS–232–C interface. Includes base module only; requires one of the following cabinet kits:	7,240	68
CK–DH11–AD	RS–232–C cabinet kit for PDP–11/24 and PDP–11/44 shielded cabinets	1,710	—
CK–DH11–A1	RS–232–C cabinet kit for unshielded cabinet models; adapter bracket included	1,710	—
DH11–N	DH11 upgrade option; 20 mA interface. Includes base module only; requires one of the following cabinet kits:	6,175	57
CK–DH11–DD	20 mA cabinet kit for PDP–11/24 and –11/44 shielded cabinets	1,775	—
CK–DH11–D1	20 mA cabinet kit for unshielded cabinet modules; adapter bracket included	1,775	—
Single-Line Synchronous Interfaces			
DUP11	Full- or half-duplex synchronous interface can be programmed to handle 8-bit character-oriented protocols such as DDCMP and Bisync and bit-oriented protocols such as SDLC and HDLC; hardware calculates CRC–16 when using DDCMP, and CRC/CCITT when using bit-oriented protocols	$ —	$ —
DUP11–AP	DUP11 system option; interfaces to Bell 200 series modems or equivalent at speeds up to 9600 bps; external cable not included	1,575	12

DEC PDP–11 Family

EQUIPMENT PRICES (Continued)

		Purchase Price	Monthly Maint.
DUP11–M	DUP11 upgrade option. Includes base module only; requires one of the following cabinet kits:	1,230	12
CK–DUP11–AD	DUP11 cabinet kit for PDP–11/24 and –11/44 shielded cabinets	345	—
CK–DUP11–A1	DUP11 cabinet kit for use with unshielded cabinet models; adapter bracket included	345	—
DMR11	High-performance DDCMP-based microprocessor and synchronous line unit interface are used in local system interconnection or for connection to external modems for remote networking; can be used to communicate with another DMR11, DMV11, or other DDCMP microprocessor-based interface, or to some other synchronous interface with software implementation of DDCMP V3.1 or 4.0; half- and full-duplex operation are supported	—	—
DMR11–AP	DMR11 system option; interfaces to EIA RS–232–C synchronous modems (Bell series compatible) at speeds up to 19.2K bps, includes data set control; cable not included	4,400	39
DMR11–BP	DMR11 system option; interfaces CCITT V3.5/DDS synchronous modems (Bell 500A LI/5 or equivalent) at speeds up to 1M bps; includes data set control and cable for modem connection	4,400	39
DMR11–CP	DMR11 system option; includes integral modem for local interconnection; cables not included	4,400	39
DMR11–EP	DMR11 system option; interfaces to EIA RS–422/CCITT V.24 synchronous modems; supports speeds up to1M bps; includes data set control for switched network operation; cable not included (cable is not available through Digital)	4,400	39
DMR11–FP	DMR11 system option; interfaces to RS–423/CCITT V.24 synchronous modems at speeds to 56K bps; includes data set control; cables not included	4,400	39
DMR11–M	DMR11 upgrade option. Includes base module only; requires one of the following cabinet kits:	4,110	39
CK–DMR11–AD	RS–232–C cabinet kit for PDP–11/24 and –11/44 shielded cabinets	290	—
CK–DMR11–A1	RS–232–C cabinet kit for unshielded cabinet models; adapter bracket included	290	—
CK–DMR11–BD	V.35 cabinet kit for PDP–11/24 and –11/44 shielded cabinets	290	—
CK–DMR11–B1	V.35 cabinet kit for unshielded cabinet models; adapter bracket included	290	—
CK–DMR11–CD	Integral modem cabinet kit for PDP–11/24 and –11/44 shielded cabinets	290	—
CK–DMR11–C1	Integral modem cabinet for unshielded cabinet models; adapter bracket included	290	—
CK–DMR11–ED	RS–422/RS–449 cabinet kit for PDP–11/24 and –11/44 shielded cabinets	290	—
CK–DMR11–E1	RS–422/RS–449 cabinet kit for unshield cabinet models; adapter bracket included	290	—
CK–DMR11–FD	RS–423/RS–449 cabinet kit for PDP–11/24 and –11/44 shielded cabinets	290	—
CK–DMR11–F1	RS–423/RS–449 cabinet kit for unshielded cabinet models; adapter bracket included	290	—
KMS11–BD	Programmable, eight-line synchronous interface; handles bit or byte protocols; depending on software, handles two lines at 19.2K bps, or four lines at 56K baud and eight lines at 19.2K baud	12,500	97
Multipoint Synchronous Interfaces			
DMP11	Microprocessors and synchronous line units provide multipoint or point to point network links using DDCMP protocol for local and remote communications; operate in full- or half-duplex mode; will support up to 32 tributaries; multipoint operation; the complementary devices must be DMP11s, DMV11s, or VAX systems DMF32s (as tributaries only); point to point communication, the DMP11 can be used to communicate with another synchronous interface having software implementation of DDCMP Version 3.1 or 4.0	$ —	$ —
DMP11–AP	DMP11 system option; interfaces to EIA RS–232–C synchronous modems (Bell series 200 compatible) at speeds up to 19.2K bps; includes data set control; cable not included	6,900	74
DMP11–BP	DMP11 system option; interfaces to CCITT V.35/DDS synchronous modems (Bell 500A LI/5 or equivalent) at speeds up to 56K bps, includes data set control cable for modem connection	6,900	74
DMP11–CP	DMP11 system option; includes integral modem; for local interconnection; cable not included	6,900	74
DMP11–EP	DMP11 system option; interfaces to EIA RS422/CCITT V.24 synchronous modems, supports up to 1M bps (HDX) or 500K bps (FDX); includes data set control for for switched network operation; cable not inlcuded	6,900	74
DMP11–FP	DMP11 system option; interfaces to RS–422/CCITT V.24 synchronous modems at speeds to 56K bps; includes data set control; external cable not included	6,900	74
DMP11–M	DMP11 upgrade option. Includes base module only; requires external cable and one of the following cabinet kits:	6,450	74
CK–DMP11–AD	RS–232–C cabinet kit for PDP–11/24 and –11/44 shielded cabinets	450	—
CK–DMP11–A1	RS–232–C cabinet kit for unshielded cabinet models; adapter bracket included	450	—
CK–DMP11–BD	V.35 cabinet kit for PDP–11/24 and –11/44 shielded cabinets	450	—
CK–DMP11–B1	V.35 cabinet kit for unshielded cabinet models; adapter bracket included	450	—
CK–DMP11–CD	Integral modem cabinet kit for PDP–11/24 and –11/44 shielded cabinets	450	—
CK–DMP11–C1	Integral modem kit for unshielded cabinet models; adapter bracket included	450	—
CK–DMP11–ED	RS–422/RS–449 cabinet kit for PDP–11/24 and –11/44 shielded cabinets	450	—
CK–DMP11–E1	RS–422/RS–449 cabinet kit for unshielded cabinet models; adapter bracket included	450	—
CK–DMP11–FD	RS–423/RS–449 cabinet kit for PDP–11/24 and –11/44 shielded cabinets	450	—
CK–DMP11–F1	RS–423/RS–449 cabinet kit for unshielded cabinet models; adapter bracket included	450	—
DEUNA–AA	DECnet option to connect Unibus systems to a DECnet Ethernet LAN; operates at 10M bps; requires H4000 transceiver or DELNI for Ethernet connection	3,500	44

DEC PDP–11 Family

EQUIPMENT PRICES (Continued)

		Purchase Price	Monthly Maint.
Ethernet Connection Options			
H4000–00	H4000 Ethernet transceiver; provides functional interface between Ethernet coaxial cable and Ethernet station	$ 300	$ —
DELNI–AA	Local Area Network Interconnect (LNI); allows Ethernet compatible devices to be configured up to 50 meters away	985	10
Multipoint Parallel Interface			
PCL11–B	Multidrop communications link that connects up to 16 processors in a local distributed processing network; data is transmitted in block mode with Direct Memory Access (DMA) via a time division multiplexed (TDM) 16-bit parallel bus; total TDM bus bandwidth ranges up to 1M bps; total bandwidth between any transmitter and receiver can be as high as 500K bps depending on the percentage of bandwidth that is allocated to the transmitter; data is transmitted at full duplex; CRC and word parity error detection supported by hardware, maximum TDM bus length is 300 ft; additional intermode cables may be purchased separately	$ 7,750	$ 66
Statistical Multiplexer			
The DEC mux terminal concentrator is a statistical multiplexer network comprised of one DZS11–EA and any combination of one or two VT1XX–EB remotely located asynchronous terminals to share a common composite communications link			
DZS11–EA	A single module containing a DZ11–A asynchronous multiplexer emulator and a statistical multiplexer; program-compatible with the DZ11–A and therefore interfaces to the operating system via standard device drivers; to VAX/VMS, A DZ Statistical Multiplexer network consisting of a DZS11–EA and one or two VT1XX–EBs appears as eight asynchronous terminals connected via a standard DZ11–A multiplexer; DZS11 can replace up to sixteen modems and eight separate telephone lines with two modems and one synchronous line; for connections less than one kilometer apart, all modems can be eliminated by using one RS422 long line cable	$ 3,250	$ 38
VT1XX–EB	An eight-channel statistical multiplexer enabling eight asynchronous terminals to be statistically multiplexed to a DZS11–EA via the composite communication link; VT1XX–EB has two composite communications ports, the main and the route-through; the main composite communication port interfaces to a primary device (a DZS11–EA or another VT1XX–EB is the second cluster controller) via the main composite link; the route-through port is implemented; both composite ports operate independently at baud rates from 1200 to 19,200 bps from an internal or external timing source.	3,250	28
Modems (Available in US only)			
DF02–AA	Direct connect, full-duplex, asynchronous modem operating at speeds up to 300 bps; allows terminals and processors to communicate over unconditioned, dial-up lines	$ 450	$ 12
DF02–AC	DF02 modem with serial Automatic Call Unit (ACU); uses asynchronous ASC11 input format at switch-selectable data rates of 110 or 300 bps; stores up 16 digits for dialing/redialing	650	14
DF03–AA	Direct connect, full-duplex, synchronous/asynchronous modem operating at speeds of 0-300 bps or 1200 bps; allows terminals and processors to communicate over unconditioned, dial-up lines	745	14
DF03–AC	DF03 modem with serial Automatic Call Unit (ACU); switch-selectable data rates of 110, 300, or 1200 bps; stores up to 16 digits for dialing/redialing	945	15
DF03–RA	DF03 module without ACU feature for DF100 rack-mountable enclosure	675	10
DF03–RC	DF03 module with ACU feature for DF100 rack-mountable enclosure	875	10
DF100–RM	Rack-mountable modem enclosure with internal 120 VAC power supply; houses 12 modules	850	17
DF100–PR	Redundant power regulator option for DF100–RM	225	—
DF104–AA	DF104 asynchronous terminal-to-processor modem; split-speed operation, 150/2400 bps; integral autodialer; standalone model	695	TBA
DF104–AM	Same as DF104–AA, but rack-mount model for DF100–RM or DF100–DT enclosure	545	TBA
DF104–BA	DF104 asynchronous processor-to-terminal modem; split-speed operation, 150/2400 bps; integral autodialer; standalone model	745	TBA
DF104–BM	Same as DF104–BA, but rack–mount model for DF100–RM or DF100–DT enclosure	595	TBA
DF112–AA	DF112 1200 bps full-duplex synchronous/asynchronous modem; compatible with Bell 212–A–type modems; integral autodialer; supports leased lines; standalone model	745	TBA
DF112–AM	Same as DF112–AA, but rack-mount model for DF100–RM or DF100–DT enclosure	595	TBA
DF126–AA	DF126 2400 bps half-duplex dialup/leased line synchronous/asynchronous modem; compatible with Bell 201 B/C modems; integral autodialer; standards model	895	TBA
DF126–AM	Same as DF126–AA, but rack-mount model for DF100–RM or DF100–DT enclosure	745	TBA
DF127–AA	DF127 4800 bps full-duplex leased-line synchronous modem; conforms to CCITT V.27 standards; standalone model	2,045	TBA
DF127–AM	Same as DF127–AA, but rack-mount model for DF100–RM or DF100–DT enclosure	1,850	TBA
DF129–AA	DF129 9600 bps full-duplex leased-line synchronous modem; conforms to CCITT V.29 standards; standalone model	3,045	TBA
DF129–AM	Same as DF129–AA, but rack–mount model for DF100–RM or DF100–DT enclosure	2,850	TBA
DF100–DT	Desktop modem enclosure; includes power supply and backplane	195	TBA

DEC PDP–11 Family

EQUIPMENT PRICES (Continued)

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	Monthly Maint.
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 inlcuded; requires Micro/PDP–11	$ 370	$ 6
DRV11	Upgrade option; includes only base option module; requires one of the following cable kits:	300	6
CK–DRV1B–KA	Cabinet kit for Micro/PDP–11 box	70	—
CK–DRV1B–KB	Cabinet kit for PDP–11/23–S box	70	—
CK–DRVIB–KC	Cabinet kit for PDP–11/23–PLUS panel	70	—
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 a single cycle mode and up to 500K words per second in burst mode; cables not included; requires Micro/PDP–11	740	9
DRV11–B	Upgrade option; includes only base option module; requires a CK–DRV1B–KA, –KB, or –KC cabinet kit	670	9
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 inlcuded; requires Micro/PDP–11, PDP–11/23–PLUS	520	9
DRV11–J	Upgrade option; includes only base option module. Requires one of the following cable kits:	450	9
CK–DRV1J–KA	Cabinet kit for Micro/PDP–11 box	70	—
CK–DRV1J–KB	Cabinet kit for PDP–11/23–S box	70	—
CK–DRV1J–KC	Cabinet kit for PDP–11/23–PLUS panel	70	—

Unibus Digital I/O Options

DR11–C	General purpose digital interface; permits bidirectional 16-bit parallel transfers between the user's device and the Unibus; includes all necessary interrupt, address, and control signals and all required cable connectors; cable for connection to user's device is not included	$ 640	$ 7
DR11–W	General purpose direct memory access (DMA) controller which interfaces user devices to the PDP–11 Unibus	1,650	11
DRS11/DSS11	Digital I/O devices. DSS11 input module provides 48 optically isolated inputs with one interrupt output. DRS11 output module provides 48 buffered outputs with one interrupt. Unibus systems support up to 16 in any combination	—	—
DRS11–A	Digital output device (TTL); includes one RC filtered interrupt input and two 19.6 ft. flat ribbon cables	1,950	22
DRS11–B	Digital output device with open collector drives; includes one RC filtered interrupt input and two 19.6-ft. flat ribbon cables	2,150	22
DRS11–MP	Optically isolated DC drives with open collectors; DRS11–B required	1,000	17
DSS11–A	Digital input device (TTL); includes two 19.6-ft. ribbon cables	2,425	17
DSS11–B	Digital input device; includes two 19.6-ft. ribbon cables	2,625	17
DSS11–MP	Contact sense input; requires DSS11–A	1,400	12

General-Purpose Unibus Interface

DRU11–C	Interfaces Unibus-based CPUs to instruments and other devices; transfer speeds up to 500 KW/sec. continuous	$ —	$ —
DRU11–CC	Alternate buffer interface with TTL drives; allows interface up to 49.2 ft. from processor	2,495	25
DRU11–CD	Alternate buffer interface with differential drivers; allows interface up to 984 ft. from processor. Includes DRU11–CC with signal conditioning module; cables not included	3,495	39

Realtime Clocks

KW11–P	Unibus programmable realtime clock	$ 880	9
KWV11–C	Q–Bus 16-bit programmable realtime clock	895	20

DEC PDP–11 Family

SOFTWARE PRICES

		License Fee ($)
Q916–UZ	Basic–Plus–2 (RSTS/E, Unibus systems)	$3,000
Q918–UZ	Basic–Plus–2 (RSX–11M/–11M–Plus, Unibus systems)	3,000
QJ913–UZ	Basic/RT–11	590
QJ993–UZ	Cobol–81 (RSTS/E, Unibus systems)	3,000
QJ994–UZ	Cobol–81 (RSX–11M/–11M–Plus, Q–Bus systems)	3,000
QP528–UZ	Dibol–11 (RSTS/E)	3,000
QP540–UZ	Dibol–11 (RSX–11M/–11M–Plus)	3,000
QJ813–UZ	Fortran IV (RT–11)	640
QR435–UZ	Fortran IV (RSTS/E)	700
QP230–UZ	Fortran IV (RSX–11M/–11–Plus)	700
QR100–UZ	Fortran 77 (RSTS/E)	3,000
QJ668–UZ	Fortran 77 (RSX–11M/–11M–Plus)	3,000
QJ128–UZ	Pascal/RSX	3,000
QR530–UZ	ADE (RSTS/E)	2,100
QP300–UZ	Datatrieve–11 (RSTS/E, Unibus systems)	3,000
QY300–UZ	Datatrieve–11 (RSTS/E, Q–Bus systems)	1,200
QP301–UZ	Datatrieve–11 (RSX–11M/–11M–Plus, Unibus systems)	3,000
QY301–UZ	Datatrieve–11 (RSX–11M/–11M–Plus, Q–Bus systems)	1,200
QJA10–UZ	DECgraph (RSTS/E)	900
QJ038–UZ	DECtype (CTS–300)	900
QR480–UZ	DECword/DP (RSTS/E)	4,500
QJ713–UZ	FMS–11 (RT–11)	1,240
QJ716–UZ	FMS–11 (RSTS/E)	1,240
QJ715–UZ	FMS–11 (RSX–11M/–11M–Plus)	1,240
QR690–UZ	Menu–11 (RSTS/E)	600
QJ122–UZ	RGL (RT–11)	1,500
QJ123–UZ	RGL (RSX–11M/–11M–Plus)	1,500
QJ291–UZ	RTEM (RSX–11M/–11M–Plus)	1,000
QP602–UZ	Sort–11 (RSX–11M/–11M–Plus)	410 ■