

DEC PDP-15 Series

MANAGEMENT SUMMARY

When first announced in early 1968 by DEC, the PDP-15 introduced the concept of packaged minicomputer systems. The PDP-15 is an 18-bit, stored-program digital minicomputer with eleven predefined package versions. These eleven standard configurations are built around one central processor, the KP 15. Six of the eleven, 15/10, 15/20, 15/30, 15/35, 15/40 and 15/50 make up the original series based on high-speed 800 nanosecond core memory. The remaining five systems, 15/73, 15/75, 15/76, 15/77, and 15/79, were announced two years later, and are based on somewhat slower, 980-nanosecond core memory. However, the newer 980-nanosecond memory for the 15 Series has protect and relocate features which make it an improvement over the original 800-nanosecond memory unit.

Basic price range for the first series begins at \$17,820 for processor, 4K word memory and output writer, and extends to \$114,900 for the minimum hardware configuration of the most powerful family member of these Series, 15/50. Core memory is available in 4K, 8K, or 16K blocks up to a maximum of 132K words for the original 15 series and is available only in 8K or 16K blocks for the Series 70 family, which also ranges up to 132K words. In order to address memory sizes larger than 32K, the KT15 relocation features and the MX15 memory multiplexer are required.

DEC's most recent improvement to the hardware efficiency of the PDP-15 is the use of a PDP-11 computer as

PDP-15 Series from DEC constitute a group of 18-bit minicomputers which challenge such established medium-scale computers as IBM 360/40, 50 and Xerox's Sigma 5. The - 15 is the largest selling 18-bit mini or equivalent-sized 16-bit mini on the market, despite its generally higher prices. DEC's secret: sell complete packages for an all-inclusive price.

CHARACTERISTICS

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

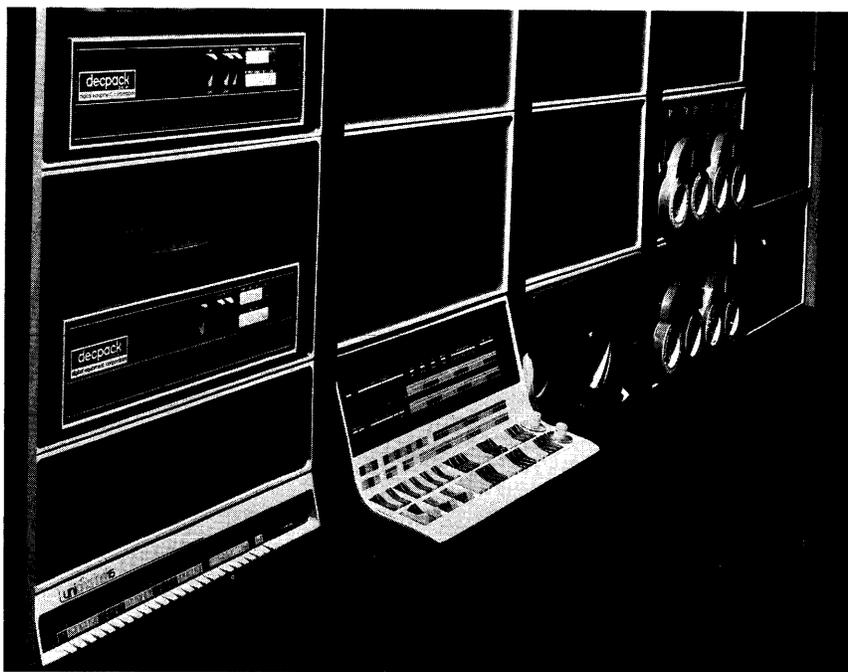
MODELS: PDP-15/10, 15/20, 15/30, 15/35, 15/40, 15/50; 15/73, 15/75, 15/76, 15/77, and 15/79.

DATA FORMATS

BASIC UNIT: 18-bit word plus one parity bit (optional).

FIXED-POINT OPERANDS: 18-bit word, comprising 17 data bits and a single sign bit, provides single-precision arithmetic. Double-word precision using three words, i.e. 52 data bits plus two sign bits, is supported.

FLOATING-POINT OPERANDS: Optional floating-point unit (FP15) is implemented through hardware. Single precision operands are 36 bits long with one eight-bit exponent, 26-bit fractions, and two sign bits. Double-precision operands are 54 bits long comprising a 17-bit exponent, 35-bit fraction, and two sign bits.



The PDP-15/76 is a dual processor computer system combining the PDP-15 family of medium-scale minicomputers with the PDP-11 family. The PDP-15 family is noted for its comprehensive software established over years of development. This software takes advantage of the computational and real-time hardware features of the PDP-15, including an integral floating point arithmetic processor and a graphics processor.

With its UNIBUS and byte manipulation capabilities, the PDP-11 family shares its strength in data processing and communications applications. The UNIBUS permits simple interfacing giving the PDP-11 a broad range of peripherals.

DEC PDP-15 Series

▷ an independent I/O processor directly connected to the 15 memory bus. This major upgrade to the -15 line is called the 15/76 packaged system, which has been particularly improved in batch throughput. RSX Plus III and DOS/BOSS, DEC's two major -15 operating systems, have recently been enhanced to increase the new system's throughput by providing spooled operation of card reader, line printers, plotters, and printer-plotters in any combination on the UNIBUS of the independent I/O processor.

Key PDP-15 features which give DEC a competitive edge in the mini market are its extremely strong offerings in applications packages. More of these are offered (such as the 15 packages for industrial control, laboratories, statistics and business applications) than virtually any other manufacturer with the exception of IBM. Additionally, the computation precision of an 18-bit word over a 16-bit word is clear since real (floating-point decimal) numbers can have a 17-bit exponent and a 35-bit fraction. Finally, DEC offers packaged systems for end users which include all the hardware features, software, support, and maintenance at a price usually lower than the cumulative cost of selecting all these components separately.

Since first deliveries in the third quarter of 1969, both PDP-15 Series have effectively replaced the PDP-9,-7, and -4. These three earlier series are completely upward compatible with both 15 Series. Of the approximately 500 remaining PDP-9, -7, and -4 estimated installations, DEC fully expects to convert these to the more powerful PDP-15. Already DEC has sold almost 700 of the upgrade series. In competitive situations, the 15 contends directly with the MODCOMP IV, the Sigma 5, SEL's SYSTEM 71, IBM's 360/44, and even DEC's PDP-11/45. Against these, DEC has thus far sold more than the combined total of the others. Servicing for the PDP-15 line is handled by DEC and its more than 1,000 technical representatives in over 35 cities in the United States and over 30 cities abroad.

Applications are the strong point for DEC in its PDP-15 Series. Not only has DEC designed and implemented strong applications packages, but the firm has also adapted specific hardware configurations to an application. As a result, DEC can go to specific control environments and offer fully checked out and integrated systems. The following complete applications packages include all necessary hardware, software, maintenance for both, and training usually for the cost of hardware, software, and maintenance alone:

TITLE	APPLICATION	CONFIGURATION	PRICE
BATCH 76	Serial task processing	15/76 Ptr, Rdr	\$81,240
RSX PLUS III/RSX 76	Time sharing, realtime processing	15/77, 32K, CRT	\$85,995

▶ INSTRUCTIONS: All instructions are one-word in length. Sixty-five instructions are standard; with the optional Extended Arithmetic Element, 26 additional instructions are available. Other optional instruction sets which can be added include: floating-point instructions (120), paper tape subsystem (nine instructions), memory protection (seven instructions), and automatic priority interrupts (four instructions).

The basic instruction set comprises five types; memory-to-memory, register-to-register, I/O control, immediate operation, and extended arithmetic element. Memory-to-memory instruction format consists of a six-bit operation code, a two-bit address type (E), and a 12-bit address. With the E field either direct or indirect addressing as well as indexing can be specified.

INTERNAL CODE: ASCII.

MAIN STORAGE

STORAGE TYPE: Magnetic core.

CYCLE TIME: 800 nanoseconds for MM15 core memory; 980 nanoseconds for ME15 core memory.

CAPACITY: MM15 core memory for the 15/10 through 15/50 ranges from 4,096 to 131,072 words in blocks of 4K, 8K, or 16K modules. ME15 core for the 15/Series 70 ranges from 16,384 to 131,072 words in 8K or 16K blocks. In order to address MM15 core storage beyond 32K words, one MX 15 Memory Multiplexor option must be added for each block of 32K additional words. Thus, the maximum core supported requires three such memory expansion units. ME15 core memory does not require the MX15 option unless expansion beyond 96K words is desired.

MM15 and ME15 memory units can be combined on a PDP-15.

CHECKING: Optional parity bit is added to 18-bit word. If the MP15 option is selected, there must be one per memory module and it must be added to all such modules or none. Additionally, the parity option adds up to 0.2 microsecond to memory cycle time.

STORAGE PROTECTION: Optional memory protection is provided by a ten-bit register which specifies boundary between user-accessible storage (upper memory) and executive or protected storage (lower memory).

Memory protection includes a boundary register for retaining the number of protected memory segments (256 words per segment), instructions for setting and resetting memory protect mode and for detecting memory protect errors. No user under memory protection can execute IOT, Halt, or Execute instructions. Also, instructions referring to protected storage are trapped. Autoindexing and channel transfers temporarily suspend memory protection.

CENTRAL PROCESSOR

GENERAL: Both PDP-11 series, the newer 15/70's and the original 15's are built on a single processor, the KP15. The Series 70 systems offer slower core and more peripherals per package. The KP15 comprises three components: a set of ten registers, a control console, and an arithmetic logic unit.

REGISTERS: Both 15 Series systems have ten user-accessible registers, eight of which are 18 bits long. One other is six bits and the last is one-bit long. The registers are ▶

DEC PDP-15 Series
PERIPHERALS/TERMINALS

DEVICE	DESCRIPTION	SPEED
MAGNETIC TAPE UNITS		
TU56 DECtape TU10-E/F	Block addressable, 150K words/reel Industry-compatible, 45 ips, 9-track (800 bpi)/7-track (200,556,800 bpi)	5K words/sec 60 KBS (max)
LINE PRINTERS/PLOTTERS		
LP 15-F	80 columns, 64 characters, controller included (1 slot)	356 to 1,110 lpm*
LP 15-H	80 columns, 96 characters, controller included (1 slot)	253 to 843 lpm*
LP 15-J	132 columns, 64 characters, controller included (1 slot)	245 to 1,110 lpm*
LP 15-K	132 columns, 96 characters, controller included (1 slot)	173 to 843 lpm*
XY 15-AA	0.01-inch step, 12" Drum Plotter, ** controller included (1 slot)	18K steps/min
XY 15-AB	0.005-inch step, 12" Drum Plotter, ** controller included (1 slot)	18K steps/min
XY 15-BA	0.01 inch step, 31" Drum Plotter, ** controller included (1 slot)	12K steps/min
XY 15-BB	0.005 inch step, 31" Drum Plotter, ** controller included (1 slot)	18K steps/min
PUNCHED CARD/OCR EQUIPMENT		
CR 15-F	Optical Reader plus control (1 slot)	300 cpm
CR 15-D	Optical Reader plus control (1 slot)	1,000 cpm
CR03-B	Card Reader with control (1 slot)	200 cpm
PAPER TAPE EQUIPMENT		
PC15	Optical Paper Tape REader Punch (1 slot)	300 cps rdr, 50 cps pch
TERMINALS		
LA30 DECwriter	Hard copy, 64 characters	30 cps
LT33D	ASR-33 Teletype	10 cps
LT33C	KSR-33 Teletype	10 cps
LT35D	ASR-35 Teletype	10 cps
LT35C	KSR-35 Teletype	10 cps
VT05	A/N CRT, 72 characters X 20 lines, full-or half duplex	110 to 2,400 bps
VP15	Storage Tube Display	-
VT01	Tektronix 611 CRT	-
VP15-B,C,D,	Three oscilloscopes with control; B and C versions come with light pen	-
VR01	Tektronix RM503 Oscilloscope Display	-
VR14	Point display oscilloscope	-
VR20	Two-color version of VR14	-
GRAPHIC DISPLAYS		
GT15-S	Interactive station, 17" display, includes VT15 buffered processor, VT04 console, VV15 vector generator, VL04 light pen	-
GT15-L	Interactive station, 21" display, includes VT15 buffered processor, VT07 console, VV15 vector generator, VL07 light pen.	-

*Minimum speed based on printing all available columns; higher speeds attained when printing partial lines and/or skipping.

**Plotters manufactured by CalComp.

TITLE	APPLICATION	CONFIGURATION	PRICE
PHA-15	Physics, pulse height analyzer	15/75 24K, CRT	\$68,700
GRAPHIC-76	On-line design system	15/76, graphic display	\$172,000
ECG-1570, 1580, 1590	Hospital analysis, electrocardiograms	15/30,/35,/40 to	\$84,900 \$162,400
MUMPS-15	Data base management system	15/75, disk/ tape	\$115,900

an accumulator, index register, program counter, loop limit register, operand address register, memory input and output registers, immediate instruction register (16 bits), data switch, and link register (one bit). Optionally, a multiply/divide register, a step counter register, a fence register (ten bits), a base register (ten bits), and an upper limit register (ten bits) are available.

INDIRECT ADDRESSING: One-level indirect addressing is allowed as standard in both PDP-15 series.

INSTRUCTION REPERTOIRE: The KP15 processor has only 65 instructions, as given below:

Memory reference:	13
Operate:	11
Register-to-Register:	28
I/O Control:	13

DEC PDP-15 Series

➤ Additionally DEC supplies SCOLDS (Spark Chamber On-Line Data System), STATPAC (extensive statistical routines), ARK-2 (interactive architectural design packages), GRASP-15 (Generalized Remote Acquisition and Sensor Processing), CSMP (Continuous Systems Modeling Program), GASPAR (Gamma Spectra Analysis), and REDAC (circuit design analysis package). Consequently, DEC is not only qualified in the applications area, they are also a leader in design and breadth of available packages. Their operating system support is equal to that of general-purpose mainframers such as IBM. Their support for both applications and system is excellent with little complaint from users.

DEC also has a Special Systems Group in Maynard, Massachusetts, which will design and build special systems for client companies. It performs the usual function of responding to client RPQ's and includes custom design of customer hardware requirements.

User reactions to the 15 Series are favorable. Those contacted have indicated either excellent or good ratings in most areas questioned.

Future prospects for the 15 Series appear brighter than DEC will exploit. The firm may be slowing development and improvements to this line in favor of letting it produce revenue for some time to come and then superseding it. By the end of 1973, the 15 Series will be four years old; other than the PDP-8, this is one of DEC's oldest lines. Industry observers expect some sort of movement by DEC to provide an upward compatible Series for the 15, possibly when it reaches the 900 to 1,000 installation level. However, for some time to come Series 15 clients will continue to find excellent performance, support, and applications from DEC albeit at a premium price.

It should be noted by prospective 15/76 users that DEC is just completing major software and operating system enhancements for the 15/76. The probable net effect of the changes is vastly improved efficiency and throughput for DEC's favorite Series 15 system, the /76. (Additional data will be included as the subject of a future update of this report as final documentation is made available by DEC.) These enhancements, in the area of RSX Plus III and DOS/BOSS, are already included in latest deliveries of the 15/76, and Digital feels that their latest modifications render the /76 as the strongest performer in the mid-range of minicomputers. □

➤ With optional Extended Arithmetic Element, 26 arithmetic instructions are added.

INSTRUCTION TIMING: All times are for fixed-point full-word operands and are given in nanoseconds:

	800 nano	980 nano
Load/Store	1.6	1.96
Add/Subtract	1.6	1.78
Multiply/Divide*	2.915**	2.915**
Compare, Branch	3.2	3.92

*Option only.

**Plus 0.26 times L or M. (L= number of 1's in multiplier; M= number of division steps).

INTERRUPTS: A single-line interrupt structure is implemented, within which the program interrupt facility temporarily halts the processor when any device flag indicates a ready state. This interrupt facility determines the exact nature and effective priority of the interrupt. With the optional Automatic Priority Interrupt (KA15) four priority levels can be added with up to 28 devices supported, but with no more than eight devices per level.

INPUT/OUTPUT CONTROL

Peripherals are connected to the 15 Series over the Uni-channel 15 or 15 I/O processor.

UNICHANNEL 15: UC 15 is a peripheral or front-end processor for PDP-15 comprising the PDP 11/05 as front-end processor and the standard UNIBUS as a second high-speed I/O channel for the 15 Series. DEC's UNIBUS is 18 bits wide and provides a data transfer rate of one million words a second. UC 15 is supported by the DOS-15 and BOSS 15 software systems. By way of hardware, UC 15 supports the RK11/RK05 DECdisk subsystem and other high-speed peripherals.

I/O CHANNELS: The 15 I/O Processor administers all data transfers between I/O devices and the CPU. Maximum data rate is one million words per second over the eight channels constituting the I/O processor.

CONFIGURATION RULES: On the common bus available with both PDP-15 series, up to eight devices can operate on a single channel for mass storage, magnetic tape equipment, and low speed devices. Generally, all devices connected to this I/O processor impose a single "bus load" such that 20 bus loads can be supported before requiring a bus repeater.

SIMULTANEOUS OPERATIONS: PDP-15 series overlap operations between instruction execution and memory accesses. Larger systems can interleave blocks of 8K words independently.

MASS STORAGE

DECdisk SYSTEM: Includes RF15 Control for up to eight disk units and fixed-head RS9 DECdisk. RS9 has a capacity of 262,144 18-bit words. Main attribute of the RS9 is that each word stored is directly addressable. Three data transfer rates (15.625K, 31.23K, or 62.5K words per second) are switch selectable. Capacity on a full system (eight drives) amounts to two megawords.

DISK PACK SYSTEM: Includes RP15 Control for up to eight drives and RP2 Disk Drive with a storage capacity of 10.24 million words per disk drive. Data is recorded in sectors of 256 words on 200 tracks per surface (20 surfaces per disk). Average access time is 62.5 milliseconds with a single transfer rate of 135K words per second. Capacity of a full system (eight disk drives) amounts to 81.9 megawords.

DEC PDP-15 Series

► **DISK CARTRIDGE SYSTEM:** Includes the RK15F control for up to eight drives, i.e. the RK05 Disk Cartridge Drive. This system requires the UC 15 channel rather than the I/O processor for connection to the system. Average access time is 50 milliseconds, and the data transfer rate is 90K words per second. Storage capacity ranges from 1.2 to 9.6 million words for eight drives.

INPUT/OUTPUT UNITS

DEC normally offers the most complete array of peripherals among minicomputer manufacturers. See Peripherals/Terminals Table.

COMMUNICATIONS CONTROL

DC01-ED SERIAL LINE SYSTEM: This system is a multi-station teletype controller which includes eight serial channels. With a separate transmit clock for each channel, the DC01-ED is designed for use in MUMPS configurations.

DP09-A DATA COMMUNICATIONS SYSTEM: Interfaces any PDP-15 to Bell System 201 or 301 data set. Fully compatible with EIA RS232B, the industry standard, this system is a bit synchronous interface which operates in full-duplex mode at 2400 baud.

LT19-D DATA COMMUNICATIONS CONTROL: Interfaces up to five Teletype line units to any PDP-15. Up to three such interface controls can be attached to a 15 processor. Total aggregate throughput rate is 30,000 baud. The control includes a cabinet.

For additional communications adapters, see the Communications portion of the Equipment Prices section.

SOFTWARE

OPERATING SYSTEMS: Six major operating systems are available on the PDP-15 systems: the Basic Monitor Software, Advanced Monitor Software, DOS-15 RSX PLUS III, BOSS 15, and MUMPS-15. DEC tailors these operating systems to the various configurations, packaged particularly for the PDP-15 Series. Each system above includes appropriate language processors, e.g. FORTRAN, FOCAL, MACRO, and BASIC, and utility routines; three include ALGOL compilers. These six prime systems are described below. Each is modular in structure with three monitor functions (I/O supervisor, file management, interrupt management), three data transfer routines, device handlers, and utility packages.

BASIC MONITOR SOFTWARE: This is the most elemental operating system, and it runs on all of 15 Series. It requires a paper-tape reader/punch for program and data I/O, a console terminal for printed output and command input and 8K words of memory. Languages supported are FOCAL, MACRO assembler, a text editor and a debugger.

ADVANCED MONITOR SOFTWARE: Includes all the facilities of Basic Monitor with the additional facility to call, store, load and execute system/user programs and to interpret and execute console commands to change I/O device assignments dynamically. AMS includes FORTRAN IV, MACRO assembler, an on-line debugger, a symbolic editor, the Peripheral Interchange Program (PIP), a linking loader, and an I/O monitor. When mass storage is selected, AMS is device independent. Minimum configuration required to support AMS is the PDP-15/20 or equivalent.

DOS-15: Includes a single-task disk-based system for interactive operations. It requires 16K words of memory, one or more available disk subsystems, and a high-speed magnetic tape subsystem. Language support is offered by FORTRAN IV, FOCAL, MACRO Assembler, a text editor, as well as debugging routines, a linking loader, librarian facility, a file utility and PIP. Minimum configuration required to run DOS-15 is the 15/75 system with disk or equivalent.

RSX PLUS III: Includes a multiprogramming, real-time system based on a disk subsystem. It is the latest version of RSX monitors which have been in use for two years. As such it offers both interactive and batch operation and comes in four versions or "kits" two of which support graphics and plotting. Major features of this operating system include: completely queued I/O processing, support for up to 100 simultaneous tasks and 138K memory, on-line program editing, compilation, and testing, plus advanced file structure. Programs run under RSX PLUS III can read DOS created files and conversely. Additionally, program development is supported via FORTRAN IV, MACRO, Text Editor, BATCH processing routines and SLIP. Minimum configuration required to support RSX PLUS III is the 15/77 or equivalent.

BOSS-15: Provides only batch processing as the Batch Operating Software System, which is disk resident. BOSS-15 is card oriented with normal output to the line printer. This operating system can operate jointly with DOS-15 as a superset thereof. Minimum configuration required to support BOSS-15 is the 15/75 or equivalent plus disk, card reader, and line printer.

MUMPS-15: Constitutes a Multi-User Multiprogramming System or data management system designed purposely for applications from a common data base. It handles text or character strings. The operating system consists of a time-sharing monitor, I/O executive, and a high-level language. Minimum configuration required to support MUMPS-15 is the 15/77 without the memory options but with the PCI line scanner.

PROGRAMMING: MACRO assembler and FORTRAN are heavily used as development languages on the 15 Series. ALGOL and FOCAL are also available but not as commonly used.

APPLICATIONS: PDP-15 Series have extensive applications packages in such areas as process control and laboratory automation, nuclear physics (PHA-15), engineering design computer aids (Graphic 15), architectural design (ARK2), printed circuit layouts (REDAC), medical and clinical (ECG-15), computation, statistics (STATPAC), and a commercial subroutine package.

PRICING

POLICY: DEC provides PDP-15 systems on a purchase basis only with maintenance agreements separately priced. For thirteen systems (namely BATCH, RSX PLUS, PHA-15, three GRAPHIC-15 versions, three ECG 15's, and four MUMPS versions), DEC packages the hardware, software, maintenance, and applications all for the price of hardware and software only. Effectively, therefore, the package system buyer receives his system without paying separately for the included software support, hardware maintenance, and training.

Monthly maintenance prices for one shift are given in the price lists following. Twelve and 16-hour service contracts ►

DEC PDP-15 Series

► are also available for approximately 13% and 26% additionally over the one-shift (eight-hour) price. Five and eight percent discounts respectively are available for paying annual service charge in advance or for electing a one-year maintenance contract at time of purchase and for including this in the purchase order. Training courses are separately

charged for beyond the free credits of four to eight weeks for the purchaser.

EQUIPMENT: DEC sells the 15 Series as basic packaged items. Thus, such typical systems are shown in the price lists. ■

EQUIPMENT PRICES

	<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Field Install.</u>
PDP-15 PACKAGED COMPUTER SYSTEMS (MM/Mk15 Memory)			
PDP-15/10 Computer System. KP15 Central Processor, 4,096 words 18-bit, 800-ns Core Memory, ASR-33 Teletype	\$17,820	\$170	—
PDP-15/20 Computer System. KP15 Central Processor, 8,192 words 18-bit, 800-ns Core Memory, KSR-35 Teletype, PC15 High Speed Paper Tape Reader and Punch, KE15 Extended Arithmetic Element, TC15 DEctape Control, TU56 Dual DEctape transport	38,880	330	—
PDP-15/30 Computer System. KP15 Central Processor 16,384 18-bit, 800-ns Core Memory, KSR-35 Teletype for BACKGROUND use KSR-33 Teletype for FOREGROUND use LT15-A Single Teletype Control, PC15 High Speed Paper Tape Reader and Punch, KE15 Extended Arithmetic Element, KA15 Automatic Priority Interrupt, KM15 Memory Protect, KW15 Rear Time Clock, TC15 DEctape Control, (2) TU56 Dual DEctape Transports	63,935	480	—
PDP-15/35 Computer System. KP15 Central Processor 16,384 words 18-bit, 800-ns Core Memory, KSR-35 Teletype, PC15 High Speed Paper Tape Reader and Punch, KE15 Extended Arithmetic Element, KA15 Automatic Priority Interrupt, KW15 Real Time Clock, TC15 DEctape Control, TU56 Dual DEctape Transport, RF15 DEcdisk Control, RS09 DEcdisk Drive 262,144 words	72,360	495	—
PDP-15/40 Computer System. KP15 Central Processor, 24,576 word 18-bit, 800-ns Core Memory, KSR-35 Teletype for BACKGROUND use, KSR-33 Teletype for FOREGROUND use, LT15-A Single Teletype Control, PC15 High Speed Paper Tape Reader and Punch, KE15 Extended Arithmetic Element, KA15 Automatic Priority Interrupt, KM15 Memory Protect, KW15 Real Time Clock, TC15 DEctape Control, TU56 Dual DEctape Transport, RF15 DEcdisk Control, (2) RS09 DEcdisk Drives 262,144 words each	98,280	630	—
PDP-15/50 Computer System. KP15 Central Processor, 16,384 word 18-bit, 800-ns Core Memory, KSR-35 Teletype, KE15 Extended Arithmetic Element, KW15 Real Time Clock, PC15 High Speed Paper Tape Reader and Punch, FP15 Floating Point Processor, RP15 Disk Pack Control, RPO2 Disk Pack Drive, 10.24 million words, TC59 Magnetic Tape Control, TU10 Magnetic Tape Transport (7- or 9-track)	114,900	648	—
SERIES 70 PACKAGED COMPUTER SYSTEMS (ME15 Memory)			
PDP-15/73 Computer System. KP15 Central Processor, 16,384 words ME15 Core Memory, LA30 DEcwriter, PC15 High Speed Paper Tape Reader and Punch, KE15 Extended Arithmetic Element, KW15 Real Time Clock	31,500	300	—
PDP-15/75 Computer System. KP15 Central Processor, 16,384 words ME15 Core Memory, LA30 DEcwriter, PC15 High Speed Paper Tape Reader and Punch, KE15 Extended Arithmetic Element, KW15 Real Time Clock, TC15 DEctape Control, TU56 Dual DEctape Transport	39,000	350	—
PDP-15/76 SERIES WITH UNICHANNEL 15			
PDP-15/76D Computer System. KP15 Central Processor, 16,384 Words ME15 Core Memory, LA30 DEcwriter, PC15 High Speed Paper Tape Reader and Punch, KE15 Extended Arithmetic Element, KE15 Real Time Clock, TC15 DEctape Control, TU56 Dual DEctape Transport, RD15 Cartridge Disk System with Unichannel-15, Peripheral Processor and 4K MM11-K Core Memory	57,900	555	—
PDP-15/76-D Computer System. KP15 Central Processor, 16,384 Words ME15 Core Memory, LA30 DEcwriter, PC15 High Speed Paper Tape Reader and Punch, KE15 Extended Arithmetic Element, KW15 Real Time Clock, TC15 DEctape Control, TU56 Dual DEctape Transport, RK15 Cartridge Disk System with Unichannel-15, Peripheral Processor and 8K MM11-L Core Memory	59,600	570	—
PDP-15/76-M Computer System. KP15 Central Processor, 16,384 Words ME15 Core Memory, LA30 DEcwriter, PC15 High Speed Paper Tape Reader and Punch, KE15 Extended Arithmetic Element, KW15 Real Time Clock, TC59 Magnetic Tape Control, TU10 Magnetic Tape Transport (7- or 9-track), RK15 Cartridge Disk System with Unichannel-15, Peripheral Processor and 4K MM11-K Core Memory	64,300	605	—

DEC PDP-15 Series
EQUIPMENT PRICES

	<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Field Install.</u>
PDP-15/16 SERIES WITH UNICHANNEL 15 (Continued)			
PDP-15/76-M Computer System. KP15 Central Processor, 16,384 Words ME15 Core Memory, LA30 DECwriter, PC15 High Speed Paper Tape Reader and Punch, KE15 Extended Arithmetic Element, KW15 Real Time Clock, TC59 Magnetic Tape Control, TU10 Magnetic Tape Transport (7- or 9-track), RK15 Cartridge Disk System with Unichannel-15, Peripheral Processor and 8K MM11-K Core Memory	\$66,000	\$620	—
PDP-15/77 Computer System. KP15 Central Processor, 24,576 words ME15 Core Memory, LA30 DECwriter, PC15 High Speed Paper Tape Reader and Punch, KE15 Extended Arithmetic Element, KW15 Real Time Clock, TC15 DEctape Control, TU56 Dual DEctape Transport, RF15 DEcdisk Control, RS09 DEcdisk Drive, 262,144 words, KM15 Memory Protect KT15 Memory Relocate, KA15 Automatic Priority Interrupt, LT15-A Single Teletype Control	69,000	550	—
PDP-15/79 Computer System. KP15 Central Processor, 16,384 words ME15 Core Memory, 16,384 words ME15 Core Memory, LA30 DECwriter, PC15 High Speed Paper Tape and Punch, KE15 Extended Arithmetic Element, KW15 Real Time Clock, TC59 Magnetic Tape Control, TU10 Magnetic Tape Transport, FP15 Floating Point Processor, RP15 Disk Pack Control, RP02 Disk Pack	91,000	730	—
PROCESSOR AND MEMORY OPTIONS			
KE15 Extended Arithmetic Element. Hardware multiply and divide.	2,800	25	\$60
KM15 Memory Protect. Hardware protection boundary.	2,900	14	100
KT15 Memory Relocation. Hardware relocation by means of program controlled register. Includes Memory Protection.	3,000	30	100
KF15 Power Fail. Interrupts computer on power failure to allow execution of register saving routines (auto restart).	1,000	3	60
FP15 Floating Point Processor. High speed 16 usec. Floating point multiplication.	12,000	75	400
KA15 Automatic Priority Interrupt. 4 hardware priority levels for up to 28 devices.	3,900	20	100
DW15-A I/O Bus Converter. Positive to negative I/O Bus converter. Allows use of PDP-9	2,160	20	100
BA15 Control for LT15A, PC15, VP15 options	Free with these options	10	—
BB15 Processor Expander Panel	Free with KM15 purchase	10	60
MX15 Memory Multiplexer. Allows access of up to 128K of MM15 Memory. Allows multi-processor systems on common memory. Note: one MX15 required for each 32K of MM15 memory in systems with more than 32K of memory.	5,000	50	300
ME15-AA 8K Memory System. (115V 60Hz) 18-bit read/write 980-ns nominal core. Self contained in rack mountable unit. Includes power supply, mounting hardware, back panel (wired for up to 24K) and first 8K of ME15 memory.	8,000	40	300
N.B. Minimum memory required for use with: ADSS & DOS—16K, RSX PLUS—24K			
ME15-AB 8K Memory System. Same as ME15-AA except (230V 50Hz).	8,000	40	300
ME15-B 8K Memory Expansion Element. Used with ME15-A, ME15-C, and ME15-D options.	8,000	40	300
ME15-C 8K Memory Expander Unit. Accommodates ME15 memory expansion into second or fourth 24K segments.	8,000	40	300
ME15-D 8K Memory Expander Unit. Accommodates ME15 memory expansion into third 24K segment.	8,000	40	300
ME15-EA 16K Memory Option. Contains a ME15-AA plus a single ME15-B option. Implement for first 16K of ME15 memory. (115V 60Hz).	14,000	80	425
ME15-EB 16K Memory Option. Same as ME15-EA except it contains ME15-AB (230V 50Hz).	14,000	80	425
ME15-F 16K Memory Option. Contains a ME15-C plus a single ME15-B option.	14,000	80	425
ME15-H 16K Memory Option. Contains a ME15-D plus a single ME15-B option.	14,000	80	425
ME15-J 16K Memory Option. contains two ME15-B options.	14,000	80	250
MM15-AB 4K, 18-bit MM15 Memory System 800-ns. (With space to add additional MK-15-A)	8,640	25	100
MM15-AC 4K 18-bit MM15 Memory System 800-ns. Expands 16K memory to 20K or 28K memory to 32K.	8,640	25	100
MK15-A 4K, 18-bit Memory Expansion Module. Expands MM15-AB and MM15-AC to 8K bank.	6,480	25	60
MM15-CB 8K, 18-bit MM15 Memory Option. Expands MM15 memory system from 8K to 16K configuration.	11,880	50	125

DEC PDP-15 Series EQUIPMENT PRICES

	<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Field Install.</u>
PROCESSOR AND MEMORY OPTIONS (Continued)			
MM15-CC 8K, 18-bit MM15 Memory Option. Expands MM15 memory system from 16K to 24K or 24K to 32K.	\$11,880	\$50	\$125
MM15-EB 16K, 18-bit MM15 Memory Option. Expands MM15 memory system from 8K to 24K (contains one MM15-CB and one MM15-CC). Also implemented as first 16K core for use in MX15 option.	21,600	100	200
MM15-EC 16K, 18-bit MM15 Memory Option. Expands MM15 memory system from 16 to 32K (contains two Mm15-CC options). Also implemented as second 16K core addition to MX15 options.	21,600	100	200
MM11-L 8K Words of 16-bit read/write core memory. 900 nsec cycle time for use with PDP-11/05. Available for expansion in PDP11/05 main frame only.	4,400	35	150
MM11-F 4K Words of 16-bit read/write core memory—950 nsec cycle time; includes system unit and UNIBUS connector. Mounts in BA11-ES for expanding Unichannel to 12K local memory.	3,500	25	150
MASS STORAGE			
RF15 DECdisk Control. Controls up to (8) RS09 DECdisk units. Includes cabinet which accommodates either (2) RS09 or (3) RS09 disks.	6,000	35	220
RS09 DECdisk Unit. 262,144 18-bit words. Unit is word addressable. Three transfer rates, switch selectable: 62.5K words/sec., 31.23K words/sec. or 15.625K words/sec.	9,000	45	240
RK15-F Cartridge Disk System. 1.2 million word DECpack Removable Disk Cartridge System. Includes Unichannel (UC15) Peripheral Processor, RK11E Disk Controller, and one RK05 Cartridge Disk Drive. Up to seven RK05 additional drives may be added.	18,900	200	440
RK05 DECpack System. 1.2 million word DECpack Drive. Removable disk cartridge. Bit transfer rate: 1.54 million bits per second. 70 millisecond average access time.	5,100	60	260
RK05-KA Spare Cartridge. 1.2 million word Disk Cartridge for the RK05 Disk Drive.	99	—	—
RP15 Disk Pack Control. Controls up to (8) RP02 Disk Pack Drives.	18,000	125	450
RP02 Disk Pack Drive Unit. 10.24 million 18-bit words/unit. Average access time 62.5 ms. Transfer rate 135K words/sec.	15,000	125	400
RP02P Spare Disk Pack.	295	—	—
MAGNETIC TAPE EQUIPMENT			
TC15 DECTape Control. Controls up to (4) TU56 Dual DECTape Transports. Operates via multicycle Data Channel.	5,400	25	240
TU56 Dual DECTape Transport. Nominal transfer rate 5K words/sec., 375 BPI. 150K words/tape reel. Redundant recording for reliability. Random access read or write in either direction.	4,700	30	60
TC59-D Magnetic Tape Transport Control. Controls up to (8) TU10-E or TU10-F Magnetic Tape Transport Units. Operates via multicycle data channel.	6,950	35	400
TU10-F Magnetic Tape Transport. 7-track, 45 ips, 200,556 and 800 bpi.	7,505	70	400
TU10-E Magnetic Tape Transport 9-track, 45 ips, 800 bpi.	7,505	70	400
CARD EQUIPMENT			
CR15-FA/FB* Card Reader & Control 300 card/min. optical reader.	5,400	75	240
CR15-DA/DB* Card Reader & Control 1000 card/min. optical reader.	10,800	75	240
CR11/A Card Reader & Control 300 cpm	4,860	50	240
CR03-B* Card Reader & Control. 200 cpm.	6,480	50	240
PAPER TAPE EQUIPMENT			
PC15 Paper Tape Reader/Punch. 300 char/sec. optical reader, 50 char/sec. punch.	4,210	30	320
LINE PRINTERS			
LP15-FA/FB Line Printer & Control 356 to 1110 lpm, 80 columns, 64 character set.	14,000	60	200
LP15-HA/HB Line Printer & Control (115V, 60Hz). Line Printer & Control (230V, 50Hz). 253 to 843 lpm, 80 columns, 96 character set.	15,500	65	200
LP15-JA/JB Line Printer & Control (115V, 60Hz). Line Printer & Control (230V, 50Hz). 245 to 1110 lpm, 132 columns, 64 character set.	19,500	75	250
LP15-KA/KB Line Printer & Control 173 to 840 lpm, 132 columns, 96 character set	21,000	80	250
X Y PLOTTERS (CALCOMP)			
XY15-AA* Plotter and Control. 0.01-Inch Step, 18,000 Steps/Minute.	9,610	30	280
XY15-AB* Plotter and Control. 0.005-Inch Step, 18,000 Steps/Minute.	9,610	30	280
XY15-BA* Plotter and Control. 0.01-Inch Step, 12,000 Steps/Minute.	14,470	35	320

*Table top model or unit.

DEC PDP-15 Series
EQUIPMENT PRICES

	Purchase Price	Monthly Maint.	Field Install.
X Y PLOTTERS (CALCOMP) (Continued)			
XY15-BB* Plotter and Control. 0.005-Inch Step, 18,000 Steps/Minute. XY15* Control only. For both Model 563 and 565.	\$14,470	\$35	\$320
LINE PRINTERS (11/05 Processor)			
LP11 Line Printer Control Logic	—	—	—
LP11-FA 80-Col Line Printer, 64 Char. 115V, 60 Hz.	12,000	60	200
LP11-FB 80-Col Line Printer, 64 Char. 230 V, 50 Hz.	12,000	60	200
LP11-HA 80-Col Line Printer, 96 Char. 115V, 60 Hz.	13,500	65	200
LP11-HB 80-Col Line Printer, 96 Char. 230V, 50 Hz.	13,500	65	200
LP11-JA 132-Col Line Printer, 64 Char. 115V, 60 Hz.	17,500	75	250
LP11-JB 132-Col Line Printer, 64 Char. 230V, 50 Hz.	17,500	75	250
LP11-KA 132-Col Line Printer, 96 Char. 115V, 60 Hz.	19,000	80	250
LP11-KB 132-Col Line Printer, 96 Char. 230V, 50 Hz.	19,000	80	250
LP11-RA Line Printer (115V, 60 Hz)	30,000	135	250
LP11-RB Line Printer (230V, 50 Hz.) 1200 lpm Printer, 132 Column, 96 Character, Includes controller.	30,000	135	250
LP11-SA Line Printer (115V, 60 Hz.)	33,000	135	250
LP11-SB Line Printer (230V, 50 Hz.) 800 lpm Printer, 132 Column, 96 Character. Includes controller.			
LS11-A Line Printer (115V, 60 Hz.)	5,615	48	120
LS11-B Line Printer (230V, 50 Hz.) 60 Lpm Printer. 132 Column, 64 Character. Includes controller.			
LV11-BA Electrostatic Printer/Plotter (115V, 60 Hz.)	11,770	50	225
LV11-BB Electrostatic Printer/Plotter (230V, 50 Hz.) Electrostatic Printer/Plotter (230V, 50 Hz.) 132 Column, 500 Lines/minute, 96 Character. 60 Hz, 115V.			
PLOTTERS (11/05 Processor)			
CalComp-563 200 and 300 steps/sec Y axis = 28.55 in. X axis = 120 ft.	10,150	35	320
CalComp-565 300 steps/sec Y axis = 11 in. X axis = 120 ft.	5,830	35	320
Complot DP-1 300 steps/sec Y axis = 11 in. X axis = 8.5 in. (144 ft. overall)	6,050	35	320
Complot DP-10 300 steps/sec Y axis = 11 in. X axis = 8.5 or 17 in.	3,445	35	320
XY 11 Incremental Plotter Control	1,185	5	50
Note 1: Includes LP11 Controller.			
MOUNTING BOXES AND POWER SUPPLIES (11/05 Processor)			
BA11-ES Extension Mounting Box with Tilt and Lock Chassis Slides. Includes fans and BC11A-8F UNIBUS cable.	400	—	30
HZ720-E Power Supply 115V, 50/60 Hz—22 @ +5V.	645	10	50
HZ720-F Power Supply 230V, 50/60 Hz—22 @ +5V.	645	10	50
SYNCHRONOUS INTERFACE (11/05 Processor)			
DP11-DA Full/Half Duplex Synchronous Line Module Set and System Unit: Double buffered. EIA/CCIT termination suitable for direct use with 201 modems. Includes 25' modem cable. Space available for 1 DP11-CA or DP11-KA.	1,510	18	125
SYSTEM UNITS (11/05 Processor)			
DD11-A Peripheral Mounting Panel (includes UNIBUS connector module—M920): Prewired system unit for 4 small peripheral controllers (1 system unit).	185	—	50

*Table top model or unit.

DEC PDP-15 Series EQUIPMENT PRICES

	<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Field Install.</u>
DATA COMMUNICATIONS CONTROL			
LT19-D Multi-Station Teletype Control. Accommodates (but does not include) up to five LT19-E line units. Three LT19-D controls can be attached to PDP-15 systems. Maximum (combined unit) throughput rate: 30K baud.	\$1,940	\$10	\$160
LT19-E Teletype Line Unit. One required for each teletype or EIA line adapter.	864	3	60
LT19-F EIA Line Adapter. Adapts each LT19-E to EIA standard levels (Dataphone compatible).	108	3	60
LT19-H Cable Set. Connects an LT19-F to either another LT19-F or PT08-F for interprocessor communication.			
LT19-HA 50 feet	64	-	-
LT19-HB 100 feet	70	-	-
LT19-HC 150 feet	75	-	-
LT19-HD 200 feet	81	-	-
LT19-HE 250 feet	86	-	-
LT15-A Single Teletype Control. Interfaces a second teletype-like device to the PDP-15 in addition to the teletype. Used for Background/Foreground, RSX and Graphic-15 applications	1,200	3	160
DP09-A Data Communications System. Compatible with EIA RS232B. Interfaces PDP-15 to Bell System 201 or 301 data set. Full duplex mode. 2400 baud, bit synchronous.	6,480	25	200
DC01-ED Multi-Station Teletype Control. Separate transmit clock per channel. Includes 8 serial channels. Used in MUMPS configurations.	6,480	20	200
COMMUNICATIONS TERMINALS			
110 BAUD UNITS			
LT33-D ASR-33 Teletype. Automatic Send-Receive Unit with paper tape reader and punch, and model TU friction paper feed.	1,620	30	120
LT33-C KSR-33 Teletype. Keyboard send/receive unit with friction paper feed.	1,275	80	25
LT35-D ASR-35 Teletype. Automatic send/receive unit with paper tape reader and punch and sprocket paper feed.	4,860	150	25
LT35-C KSR-35 Teletype. Keyboard send/receive unit with sprocket paper feed.	3,240	80	22
300 BAUD UNITS			
LA30-CA DECwriter DATA Terminal. Serial input/output device. Switch selectable baud rates of 110, 150 and 300. Prints 80 char. lines at six lines/inch on 9-7/8" wide continuous form.	3,195	100	30
2400 BAUD UNITS			
VT05 Alphanumeric Video Display Terminal. CRT display with keyboard. Half or full duplex. Displays 20 lines of 72 char. on 8-3/4" x 6-3/8" screen. Teletype compatible at rates up to 2400 baud.	2,795	80	22
VP15-A Storage Tube Display and Control. 10-bit data word per direction (one part in 1024 resolution). Storage and non-storage modes under program control. Erase is push button or program controlled. Table top unit is 5-1/4" x 6-3/8". Includes VT01-A display.	6,260	86	200
VT01-A Storage Tube Display only. Rack mountable.			
VP15-B Oscilloscope and Control. 5" diameter. 10-bit data word per direction (one part in 1024 resolution). Plotting rate 12 μ sec/point.	3,885	30	70
VP15-BL Oscilloscope and Control with Light Pen. Same as VP15-B but works in conjunction with light pen.	5,640	35	150
VP15-C Oscilloscope and Control—7" x 9" VR14 X-Y display system with 10-bit data word per direction (one part in 1024 resolution).	6,260	44	200
VP15-CL Oscilloscope and Control with Light Pen. Same as VP15-C with light pen.	8,015	49	300
VP15-D Two Color Oscilloscope and Control. Red/Green 7" x 9" X-Y display system with 10-bit data word per direction (one part in 1024 resolution). Programmable color change.	7,000	50	220
VR01-A Oscilloscope only. 5" diameter display screen, P7 phosphor standard.	1,080	14	90
VR14 Oscilloscope only. 7" x 9" display screen. P31 phosphor standard.	3,240	19	100
VR20 Two Color Oscilloscope only. Red/Green 7" x 9" X-Y Display.			
GT15-SA Graphic Terminal. Interactive graphic station with 17" (diagonal) display including VT15, VT04, VV15 and VL04.	24,000	138	1,028
GT15-LA/LB Graphic Terminal. Interactive graphic station with 21" (diagonal) display including VT15, VT07, VV15 and VL07.	29,000	163	1,125
VT15-A Graphic Display Processor. Read only memory, high speed ASCII character generator. Optional: light-pen, writing tablet, keyboard, arbitrary vector generator, slave display multiplexer.	15,550	86	500

DEC PDP-15 Series
EQUIPMENT PRICES

	Purchase Price	Monthly Maint.	Field Install.
2400 BAUD UNITS (Continued)			
VT04-A/B Graphic Display Console. Display console with 17" diagonal CRT (9-1/4" x 9-1/4" major drawing area, 1-1/4" x 9-1/4" menu area).	\$4,860	\$25	\$250
VT07-A/B Graphic Display Console. Display console with 21" diagonal CRT (12" x 12" major drawing area, 2" x 12" menu area).	10,800	50	350
VV15 Arbitrary Vector Generator. Permits drawing of stroke vectors in any direction via hardware.	5,000	20	200
VM15 Display Multiplexer. Controls up to 4 VTO4's.	5,000	20	200
LK35 Keyboard. Remote electronic keyboard for VT04. Mounts in VT04 console.	1,295	30	120
LK37 Keyboard. Free standing remote electronic keyboard for use with VT07 console.	1,295	30	120
VL04 Light Pen. Interacts with refresh type display.	755	7	75
VL07 Light Pen. Interacts with VT07 display console.	755	7	75
VW01-BP Writing Tablet and Control. Includes Spark Pen and 11" x 11" writing tablet. 10-bit data word per direction (one part in 1024 resolution).	3,780	30	200
VW01-MX Writing Tablet Multiplexer. Accommodates up to three additional VW01-MA writing tablets. VW01-MA Writing Tablet and Spark Pen. Additional 11" x 11" writing tablet with VW01-SP spark pen.	1,080	5	75
VW01-SP Spark Pen. Replacement spark pen only.	215	10	75
VW01-WT Writing Tablet. Replacement 11" x 11" writing tablet only.	860	10	75
INDUSTRIAL CONTROL OPTIONS			
BD15-A/B Central Control Unit, 115V, or 230V. Controls up to (11) AFC15 options (2048 analog channels) and (11) UDC15 options (4096 digital points in 16-bit I/O words).	8,100	50	400
AFC15-A/B Analog Input Scanner, 115V or 230V. Accommodates up to (5) AM07-B's of 32 channels each, to provide a maximum of 192 channels. Allows sampling of 200 channels/second and 20 samples/second on the same channel using a 12-bit converter (11 bits + sign) and a switched gain amplifier (max. gain of 1000). AFC15 scanner is the "flying capacitor" type.	5,400	25	75
AM07-B Expander Unit. Each unit can accommodate a maximum of 32 channels.	320	3	30
BA150 Multiplexer Module. Eight channel flying capacitor multiplexer. One required for each 8-channel group.	320	4	40
BA903 Direct Signal Module. Input range: 0 to 10 volts. One required for each 8-channel group.	45	4	40
BA904 Voltage Conditioning Module. Input signal 0 to 100 volts. 10:1 voltage conditioning. One required for each 8-channel group.	160	4	40
BA905 Current Conditioning Module. Current input 0 to 50 mA. One required for each 9 channel group.	85	4	40
BC90C-4 Cable and Screw Terminal Assembly. One required for every two BA150 modules.	80	—	—
UDC15 Digital Input/Output Controller. Basic unit consists of cabinet, one DD02 system unit (unit does not include I/O word or power modules and screw terminal assembly) and provision for the mounting of five additional DD02's. Provides for maximum of 24 16-bit I/O words (total of 384 digital points).	3,020	20	60
DD02 System Unit. Each unit can accommodate four 16-bit I/O words (64 digital points).	320	2	20
BM685 Flip-Flop Driver Module.	170	1	4
BM687 Single-Shot Driver Module.	360	2	8
BW741 Contact Sense Module.	270	2	15
BW743 Contact Interrupt Module.	405	2	15
BM803 Latching Relay Module.	660	2	15
BM805 Flip-Flop Relay Module.	575	2	12
BM807 Single-Shot Relay Module.	690	2	15
BW400 Isolated Power Card Module.	44	N/A	N/A
BW402 Common Power Card Module.	44	N/A	N/A
BW403 Relay Power Card Module.	44	N/A	N/A
BC40C Cable and Screw Terminal Assembly. One required for each I/O word.	60	N/A	N/A
NP15 Nuclear Physics Assembly. Includes NP02-LA first mode PHA interface, 841B/828 power supply control. CSS/716 indicator panel and power supply and H960-A cabinet. Implements 1 or 2 customer-furnished ADC's and a "live-time" clock.	6,370	30	300
CA15-A CAMAC Interface. Branch driver for up to 7 CAMAC crates, includes Indicator Panel, Cabinet and Power Supply. Operates under program control or via 3 cycle data channel. Communicates with customer furnished CAMAC Type A Crate controller.	10,745	75	900

LABORATORY DATA ACQUISITION EQUIPMENT

AD15 A/D Converter. Medium speed, three-cycle data channel device. Includes interface and control, ADC, S/H programmable gain amplifier with full scale of $\pm 10.0V$, one AM01-A and one BA124. Provides expandability to 128 channel capability by implementation of 3 additional AM01-A units. 30 kHz max. conversion rate (12 bit + sign) with 22 kHz throughput.	6,480	25	350
---	-------	----	-----

**DEC PDP-15 Series
EQUIPMENT PRICES**

	<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Field Install.</u>
LABORATORY DATA ACQUISITION EQUIPMENT (Continued)			
AM01-A Expander Unit. Permits AD15 expansion in 32-channel blocks. One required for each 32 channel group. AM01-A for first 32 channels is supplied with AD15. Up to 3 additional AM01-A units may be implemented. Each accommodates (8) BA124 modules.	\$540	\$5	\$75
BA124 Analog Multiplexer Switch. Four channel MOSFET switch module, one required for each 4-channel group.	70	2	8
ADP15-CA/B High Speed A/D Converter (115V or 230V). 100 kHz throughput rate; 0.36 analog channel capability wired in 32-channel groups. Wiring for first 32 channels included. Six operating modes. Otherwise similar to AD15.	9,720	30	200
AA15-B D/A Multiplexer Control. Accommodates up to sixteen AAC2 12-bit D/A channels.	4,860	7	350
AAC3 D/A Converter. Digital-to-Analog, single buffered, 0 to $\pm 10V$.	375	6	**
AF04-B Integrating Digital Voltmeter. Analog input subsystem with Multiplex control for 10-1000 3-wire high or low level differential analog inputs ($\pm 300V$ full scale ranges with programmable range and autoranging). Includes panel for 200 channels.	20,000	120	1,050
AF04-X Expansion Mounting Panel. Expands AF04-B system by 200 channels. Up to 4 additional 200 channel groups may be added to AF04-B. Each accommodates 20 AF04-S options.	1,940	6	60
AF04-S Multiplexer Switch Module. 10 channel guarded-reed relay switch. Low level.	355	3	40

SOFTWARE PRICING—MAJOR PDP-15 SOFTWARE SYSTEMS

Recommended Software Services and Support

Software Product	License Price	Support Class*	Installation & Advisory Support	1-Year Subscription Service**	Programming Training Courses
Advanced Software System	\$500	Class 1	\$528 2 days	Plan A: \$180 Plan B: \$500	PDP-15 systems software. 2 weeks \$540
Background/Foreground System	\$500	Class 1	\$1320 5 days	Plan A: \$180 Plan B: \$750 See Note 2	Same as ADSS
DOS-15 Disk Operating System	Binaries Binaries and only—\$500 Sources— \$1000	Class 1	\$792 3 days	Plan A: \$180 Plan B: Binaries only—\$750 Binaries and Sources— \$1250	Same as ADSS
BOSS-15 Batch Operating System	Binaries only —\$1000 Binaries and Sources—\$1500	Class 1	\$528 2 days	See Note 3.	BOSS 15 and Fortran IV 1 week \$325
RSX PLUS III	\$2000	Class 1	\$264 1 day	Plan A \$ 180 Plan B \$1000 (incl. DOS binaries and RSX sources); \$1500 (incl. DOS binaries, DOS and RSX sources)	RSX PLUS 1 week \$325
RSX Graphics ⁵	\$1000	Class 1	\$264 1 day	—	Graphic-15 Software 1 week \$325
MUMPS 15	\$4500	Class 1	\$2640 10 days (mandatory for first time users)	—	On request

*Class 1 is full software support, i.e., continuing maintenance and/or development.

**Plan A, monthly newsletter on remedial support and new software developments and techniques. Plan B, same newsletter plus semiannual software updates of binary/source tapes and manuals as well as software fixes within an average of three weeks.