

Perkin-Elmer Series Sixteen

MANAGEMENT SUMMARY

Perkin-Elmer's Computer Systems Division, formerly known as Interdata, Incorporated, has reconfirmed a strong commitment to its 16-bit computer line with the introduction of Series Sixteen, which initially consists of four models: the 1615, 1624, 1625, and 1635 Systems.

Of Perkin-Elmer's previous 16-bit processors, only the 6/16 and 8/16E are currently marketed. The 6/16 was first introduced in November 1975, and the original 8/16 was announced in July 1976. The 8/16E, an 8/16 processor enhanced with integral memory management (which enabled the 8/16E to support four times the memory of the 8/16) and four new instructions, was introduced in September 1977.

The four models of the Series Sixteen family are based on three Perkin-Elmer processors: the Sixteen 10, Sixteen 20, and Sixteen 30. All are MOS-based machines incorporating either 4K or 16K RAM memory chips. The 8-slot Sixteen 10 is available with either 16K or 32K bytes of 900-nanosecond memory with parity. The Sixteen 20, also an 8-slot processor, is offered with 32K, 64K, 128K, or 256K bytes of 900-nanosecond memory with parity. The Sixteen 30, with 16 slots, is available with 32K, 64K, 128K, or 256K of 750-nanosecond ECC MOS memory.

The 1615 System is the low-priced entry system to the Series Sixteen and has all the standard features carried through the Series Sixteen product line. The 1615 is based on the Sixteen 10 processor and has 32K bytes of parity MOS memory, field-expandable to 64K bytes on a single memory board; multiply/divide and list processing instructions; and 255 hardware-vectorred interrupts. ➤

Perkin-Elmer has extended its 16-bit product line to include four new models with the overall identification of Series Sixteen. Memory capacity ranges from 32K to 256K bytes. The new models are upward-compatible with other Perkin-Elmer 16-bit and 32-bit computers. Packaged systems prices range from \$12,570 to \$29,500, while the basic, low-end Sixteen 10 processor lists at \$5,400.

CHARACTERISTICS

MANUFACTURER: Perkin-Elmer Corporation, Computer Systems Division, 2 Crescent Place, Oceanport, New Jersey 07757. Telephone (201) 229-6800.

The Computer Systems Division of Perkin-Elmer was known as Interdata, Inc., before all data processing activities were recently unified under the name Perkin-Elmer (e.g., the Interdata 8/32 Megamini is now the Perkin-Elmer 8/32). The Computer Systems Division, with 1,300 employees, specializes in minicomputer hardware, software, and systems for manufacturers and end-users in business/scientific computation, simulation, and all OEM markets. The company also supplies products for data communications, discrete manufacturing, industrial process control, and laboratory automation. The parent company, Perkin-Elmer, is an international corporation employing about 13,000, with interests in instrumentation, optical and electro-optical systems, flame spray equipment, control systems, and navigational instrumentation, in addition to the Computer Systems Division's marketing areas.

MODELS: 1615, 1624, 1625, and 1635.

DATE ANNOUNCED: November 1978. ➤



The top of the Series Sixteen line is the 1635, based on a 16-slot CPU. The Error Checking and Correcting MOS memory is field-expandable from 128K to 256K bytes on a single memory board. The 1635 supports single- and single/double-precision floating-point processors and has hardware multiply/divide, privileged instruction detection, memory processor integrity test, and optional battery backup for two hours.

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➤ Peripherals include a 512K-byte dual floppy disk drive, a Model 550 video display unit with an imbedded 12-key numeric pad and a 1920-character screen, and a Model 655 thermal page printer which operates at 100 characters per second and prints a complete screen in 20 seconds. System integrity features include memory parity, power fail/auto restart, six-minute battery backup, and memory processor integrity test which performs basic processor and memory checks prior to execution of the OS loader. The Sixteen 10 CPU can be upgraded to a Sixteen 20.

The 1624 System, based on a Sixteen 20 processor, has a 64K-byte parity MOS memory, field-expandable to 256K bytes on a single memory board; multiply/divide instructions; support for single- and single/double-precision floating-point processors; privileged instruction detection; and 255 vectored interrupts. The peripherals include the dual floppy disk drive and the Model 550 video display unit, which are found on the 1615, and a microprocessor-controlled CP 120 printer with 132 print positions, bi-directional printing, electronic vertical format unit, and self-test capability. The 1624's other features are the same ones featured on the 1615.

The 1625 System, like the 1624, is based on a Sixteen 20 processor. The basic 64K bytes of parity MOS memory is field-expandable to 256K bytes on a single memory board. The 1625 has a 10-megabyte disk drive instead of the dual floppy disk drive found on the 1615 and 1624 and also has a 56-inch cabinet instead of the 1615 and 1624's 28-inch cabinet. In all other respects, the 1625 has the features of the 1624.

The top of the Series Sixteen line is the 1635, based on the 16-slot Sixteen 30 processor. The Error Checking and Correcting MOS memory is field-expandable from 128K bytes to 256K bytes on a single memory board. The 1635 also includes hardware multiply/divide, support for single- and single/double-precision floating-point processors, 255 vectored interrupts, battery backup for six minutes, privileged instruction detection, memory processor integrity test, and power fail/auto restart. An optional programmable hardware memory protect unit and optional extended battery backup for 120 minutes are available. Peripherals are the same ones offered with the 1625 with the substitution of a 180-character-per-second printer for the 120-cps printer.

The four Series Sixteen systems as described are priced at \$12,750, \$17,700, \$24,250, and \$29,500, respectively.

All current Perkin-Elmer 16-bit processors are upward-compatible with other Perkin-Elmer 16-bit and 32-bit minicomputers from both a software and hardware standpoint. All of the Series Sixteen processors operate under the OS/16 operating system and can utilize the entire range of Perkin-Elmer peripherals and 16-bit language processors currently available.

The OS/16 operating system is a generally compatible subset of OS/32, the operating system for Perkin-Elmer's ➤

➤ **DATE OF FIRST DELIVERY:** January 1979.

NUMBER INSTALLED TO DATE: Not available.

DATA FORMATS

BASIC UNIT: 16-bit halfword.

FIXED-POINT OPERANDS: The basic unit for fixed-point arithmetic operations is a 16-bit halfword. With the multiply/divide instructions, 32-bit fullwords constitute the fixed-point product length. Two's complement arithmetic is used. The multiply/divide instructions are standard on all Series Sixteen models.

FLOATING-POINT OPERANDS: Optional in the 1624, 1625, and 1635. Single-precision floating-point numbers are represented by a 24-bit fraction and an 8-bit exponent which includes the sign. A 64-bit doubleword represents a double-precision floating-point number, with the fraction being 56 bits and the exponent 8 bits including the sign.

LOGICAL OPERANDS: 8-bit bytes, 16-bit halfwords. Logical operations can also be performed on single bits located in bit arrays.

INSTRUCTIONS: The 16-bit processors have instructions which are either 16 or 32 bits long in four separate formats: Register-to-Register (RR), Short Form (SF), Register and Indexed Storage (RX), and Register and Immediate Storage (RS).

All instruction formats have a one-byte operation code in bits 0 to 7. RR format instructions are all two bytes long. Bits 8 to 15 allocate four bits to each of the two registers involved in a given operation. SF format instructions are also two bytes long, with bits 8 to 11 allocated to a register designation and bits 12 to 15 allocated for immediate data. The SF format, besides being used for short-field immediate instructions, is utilized for short shifts, where bits 12 to 15 give a shift count, and short branches, where bits 12 to 15 specify a halfword displacement from the current instruction address.

In the 32-bit RX format, bits 8 to 11 indicate a register, bits 12 to 15 an index register, and bits 16 to 31 a memory address. The RS format is similar to the RX format except that bits 16 to 31 represent an immediate operand, which may be modified by the contents of the index register. All instruction types are represented among the four formats.

INTERNAL CODE: ASCII.

MAIN STORAGE

STORAGE TYPE: MOS RAM with parity in the 1615, 1624, and 1625; ECC MOS RAM in the 1635.

CYCLE TIME: 990 nanoseconds on the Sixteen 10 and Sixteen 20 processors; 750 nanoseconds on the Sixteen 30.

CAPACITY: The 1615 basic memory of 32K bytes is field-expandable to 64K bytes on a single memory board.

Both the 1624 and 1625 have 64K bytes of memory, field-expandable to 256K bytes on a single memory board.

The 1635 includes 128K bytes, field-expandable to 256K bytes on a single memory board.

CHECKING: The 1615, 1624, and 1625 memories include parity. One parity bit is associated with each 16-bit halfword and is added by the parity controller to each halfword written into memory and checked when read by the same controller. ➤

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PERIPHERALS/TERMINALS

DEVICE	DESCRIPTION & SPEED
MAGNETIC TAPE EQUIPMENT	
M46-490, -492	9-track; 800 bpi, 75 ips, NRZI drive, 10.5-inch reels, dual gap recording, read-after-write; M46-490, -492 are master drives; M46-491, -493 are add-on drives; 60 KBS
M46-494, -496	9-track; 800/1600 bpi, 75 ips, NRZI/PE drive, 10.5-inch reels, dual gap recording, read-after-write; M46-494, -496 are master drives; M46-495, -497 are add-on drives; 60/120 KBS
M46-532, -533	Same as M46-490, -492 but includes 16-bit DMA; M46-491, -493 are add-on drives
M46-536, -537	Same as M46-494, -496 but includes 16-bit DMA; M46-495, -497 are add-on drives
M46-524, -525	9-track; 800 bpi, 45 ips, NRZI drive, 10.5-inch reels, dual gap recording, read-after-write, 16-bit DMA; M46-524, -525 are master drives; M46-501, -502 are add-on drives; 36 KBS
M46-528, -529	9-track; 1600 bpi, 45 ips, PE drive, 10.5-inch reels, dual gap recording, read-after-write, 16-bit DMA; M46-528, -529 are master drives; M46-515, -516 are add-on drives; 72 KBS
PRINTERS	
M46-221, -222	Matrix printer; 132 positions, 96-character set, 10 characters per inch, 6 lines per inch, 4- to 14.8-inch paper, 9 x 9 dot matrix, 2-channel VFU; 120 cps
M46-223, -224	Same as M46-221, -222 but 180 cps
M46-300, -301, -302, -303	Line printer; band, 132 positions, 64- or 96-character set, 10 characters per inch, 6 lines per inch, 3- to 16-inch paper, 12 channel VFU, 25-ips (min.) slew rate; 300 lpm
M46-304, -305, -306, -307	Same as M46-300 thru -303 but 600 lpm
PUNCHED CARD EQUIPMENT	
M46-238, -239	Reader; 80-column, 1500-card hopper, 500-card stacker; 400 cpm
M46-236, -237	Reader; 80-column, 1500-card hopper, 1500-card stacker; 1000 cpm
TERMINALS	
M46-041, -042, -046, -048	Model 1200 Video Display Unit; 1920 characters, 24 lines x 80 characters, 9 x 12 dot matrix, typamatic repeat key feature, transparent mode for program debugging, 128 ASCII character set, numeric keypad, buffered print port, opt. X-4 coordinate line drawing capability, includes controls for inverse video, half intensity, blink, protected, nondisplay, and modified field definitions; editing features include insert/delete character or line, clear screen, clear unprotected and clear line/field; send key for transmitting all or part of screen data; up to 9600 bps; M46-046, -048 include function key set
M46-044, -045	Printer port for Model 1200 (M46-044 for RS-232C interface, M46-045 for current loop)
M46-066, -068	Model 650 thermal printer for use with Model 1200 VDU; requires M46-044 or M46-045
M46-110, -111, -112, -113, -114	Model 550 Video Display Unit; compact interactive VDU, 1920-character screen, 7 x 10 character field, 128 ASCII character set, anti-glare screen, imbedded 12-key numeric pad, opt. foreign character sets, opt. current loop interface, up to 9600 bps, transparent mode for program debugging; M46-110 does not include printer port, M46-111 thru -114 include printer port
M46-080, -082	Model 655 thermal printer for use with Model 550 VDU (M46-111 thru -114)

➤ 32-bit computers. OS/16 offers roll-in/roll-out capability, support for up to 16 interactive terminal users, support for two file types (indexed and contiguous), output spooling, and overlay facilities. Software packages supported under OS/16 include: Extended FORTRAN IV, BASIC Level II, CAL (Common Assembly Language), ITAM/16 (with 2780/3780 RJE emulation), and HASP/16. OS/16 is included with each of the Series Sixteen systems.

In November 1975, Perkin-Elmer (then still Interdata) introduced peripheral systems for analog and digital input/output called Mini I/O, which is supported by the OS/16 operating system. Mini I/O is designed for use in such areas as laboratory automation and materials ➤

➤ **Error Checking and Correcting (ECC) memory is standard on the 1635. ECC memory corrects all single-bit errors and detects and flags all double- and many multiple-bit errors.**

STORAGE PROTECTION: None.

CENTRAL PROCESSOR

GENERAL: The computers in this series are 16-bit, parallel, register-based, microprogrammed processors employing Schottky logic. Included with each processor as standard features are 16 general-purpose registers, a buffered multiplexer I/O channel, DMA bus, 255 hardware vectored interrupt levels, serial I/O port, power fail/auto restart, OS/16, MT2 Bootstrap ROM, and an extended selector channel. The serial I/O port provides either an RS-232 or 20ma interface to ASCII terminals such as a CRT or a tele- ➤

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▷ handling. Programming can be handled through Perkin-Elmer supervisory calls or via ISA real-time extensions to FORTRAN.

Perkin-Elmer sales offices are located in 32 U.S. cities in 22 states, while repair centers are located in 38 U.S. cities in 25 states. Depot repair capabilities are located in five of these cities. Internationally, Perkin-Elmer has subsidiaries in the United Kingdom, West Germany, France, Canada, Singapore, and Australia. Distributors handle the rest of the world and are located in Tokyo, for the Far East market; Chile, Bolivia, and Venezuela, for the South American market; Turkey, for the Asian market; and South Africa. Service facilities are located in 26 cities for the international market. Eleven of these cities have depot repair capabilities.

Maintenance is available on a contract basis for one, two, or three shifts, as well as on-call/on-site service and depot repair service. Training is available on both software and hardware topics. A large number of courses is currently offered on a regularly scheduled basis at varying tuitions per course. For information regarding course content, location, and pre-requisites, contact the Technical Training Center in Neptune, New Jersey, (201) 988-0400. Information regarding on-site training courses is also available. Hardware and software subscription services are each offered to users of Perkin-Elmer systems at \$200 per year.

USER REACTION

Datapro surveyed five Series Sixteen users, chosen from a list furnished by Perkin-Elmer, during December 1979. The users included a systems house which concentrates on data communications; a vendor of software products and systems; a supplier of banking systems, primarily document handling; and two OEM's, one of whom specializes in federal government work.

The five users had 162 systems in operation, and all had been purchased outright. One user accounted for 150 of the systems; another had six; another had four; and the other two users had one each. Memory covered the range from 64K bytes to the maximum 256K bytes. The three users with on-line disk storage had 10, 20, and 40 megabytes.

All were using the Perkin-Elmer operating system and the Perkin-Elmer assembler, but one user had modified the assembler. One user also programs in FORTRAN. The systems were being used for scientific and engineering computing, software development, business data processing, real-time control, data communications, data base management, automatic testing, and air traffic control. Applications programs had been written by in-house personnel in all five cases, while ready-made programs from Perkin-Elmer and the use of a contract programming house were each reported by one user.

The results of Datapro's survey are summarized below: ▷

▷ typewriter employed as a programmer's console, an operating system command device, or an I/O terminal.

REGISTERS: The 16 general-purpose hardware registers, numbered 0 through 15, are each one halfword (16 bits) in length. All except register 0 can be used as index registers. None of the registers is dedicated to any specific purpose such as index register, stack pointer, program counter, or subroutine return pointer but may be used for the storage of partial results, frequently used constants, loan management constants, etc. The single- or single/double-precision floating-point options for the 1624, 1625, and 1635 add eight 32-bit registers to the standard complement.

ADDRESSING: Three addressing modes are available in the Series Sixteen: direct, indexed, and relative. For indexing, 15 of the 16 general-purpose registers can be used. Indirect addressing is not available. Memory is addressed by byte.

INSTRUCTION REPERTOIRE: The Series Sixteen processors have a set of 167 basic instructions, whose formats are similar to those of IBM 360/370 systems. Perkin-Elmer has added several classes of instructions to increase memory utilization efficiency. The instruction set provides both 16- and 32-bit formats and permits operation between any two general registers (RR), a general register and a memory location (RX), a general register and a 16-bit data constant carried in the primary instruction word (RI), or a general register and a four-bit data constant (SF).

The instruction set performs the following classes of instructions: load/store byte, halfwords, and multiple halfwords; fixed point arithmetic on halfword with arithmetic carries for multi-precision; logical operation (AND, OR, Exclusive OR, Compare, and Test); logical and arithmetic shifts and rotate on halfwords and fullwords; floating point arithmetic on single (32-bit) and double (64-bit) precision operands; conditional branch operation on logical and arithmetic operands; processor status and control; list and queue processing capabilities; and input/output.

INSTRUCTION TIMINGS: All times in the following table are for halfword fixed-point operations, in microseconds.

	MOS with parity		ECC MOS
	1610	1620	1630
Load/Store	1.00/3.25	0.825/3.025	0.75/2.75
Add/Subtract	1.00/1.00	0.825/0.825	0.75/0.75
Multiply/Divide	23.0/41.0	23.0/41.0	7.50/10.75
Compare & Branch	2.25	2.20	2.00

Typical instruction timings for the 1624, 1625, and 1635 optional floating-point feature are given below, in microseconds.

	Single-Precision Floating-Point		Double-Precision Floating-Point	
	1620	1630	1620	1630
Load/Store	2.45	2.25	7.60	7.00
Add/Subtract	3.70	3.50	3.70	3.50
Multiply/Divide	10.45/	10.25/	16.45/	16.25/
	12.75	12.25	16.95	16.75
Compare	2.65	2.50	2.65	2.50

INTERRUPTS: 255 vectored hardware interrupts for peripheral devices are available on Series Sixteen processors. In addition, there are four internal fault interrupts: machine malfunction, SVC (Supervisor Call), illegal instruction, and fixed-point divide fault. Software vectoring of interrupts is provided for compatibility with previous Perkin-Elmer processor models. This mode is enabled when bit 4 of the current program status word is reset and bit 1 is set. ▷

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CHARACTERISTICS OF THE SERIES SIXTEEN SYSTEMS

SYSTEM	1615	1624	1625	1635
CPU	Sixteen 10	Sixteen 20	Sixteen 20	Sixteen 30
Memory min./max./type	32K/64K/parity MOS	64K/256K/parity MOS	64K/256K/parity MOS	128K/256K/ECC MOS
Mass Storage	Dual floppy disk drives (512K bytes)	Dual floppy disk drives (512K bytes)	10-megabyte disk	10-megabyte disk
Terminal	Model 550 VDU	Model 550 VDU	Model 550 VDU	Model 550 VDU
Printer	Model 655, thermal, 100 cps	Serial, 132 positions, 120 cps	Serial, 132 positions, 120 cps	Serial, 132 positions, 180 cps
Serial I/O port	Yes	Yes	Yes	Yes
Chassis	8 slots	8 slots	8 slots	16 slots
Power supply	50 amp	50 amp	50 amp	50 amp
Memory processor integrity test	Yes	Yes	Yes	Yes
Power fail/auto restart	Yes	Yes	Yes	Yes
Battery backup	6 mins.	6 mins.	6 mins.	6 mins.
OS/16 auto loader	Yes	Yes	Yes	Yes
System terminal and control panel	Yes	Yes	Yes	Yes
Operating system	OS/16 plus utilities	OS/16 plus utilities	OS/16 plus utilities	OS/16 plus utilities
Cabinet	28-inch	28-inch	56-inch	56-inch



	Excellent	Good	Fair	Poor	WA*
Ease of operation	1	2	2	0	2.8
Reliability of mainframe	3	2	0	0	3.6
Reliability of peripherals	2	2	0	0	3.5
Maintenance service:					
Responsiveness	0	3	1	0	2.8
Effectiveness	0	3	1	0	2.8
Technical support	1	0	3	1	2.2
Manufacturer's software:					
Operating system	0	1	2	0	2.3
Compilers and assemblers	1	1	1	1	2.5
Applications programs	0	0	1	0	2.0
Ease of programming	1	3	1	0	3.0
Ease of conversion	1	2	0	0	3.3
Overall satisfaction	0	5	0	0	3.0

*Weighted Average on a scale of 4.0 for Excellent.

These users were particularly impressed with the systems' cost effectiveness, price/performance, hardware reliability, ease of programming, and the compatibility between the assembler language and the IBM 360/370. Perkin-Elmer was praised for "trying to maintain compatibility between their 16- and 32-bit machines" and for the "ease of dealing with P-E." One user said that the "architecture of the machine is good for generating programs."

On the negative side, these users commented on the stability of the operating system, complained that the memory mapping is not the best, that Perkin-Elmer's 32-bit software is quantum leaps ahead of the 16-bit, that the text editors are weak, and that the system still seems to be card-oriented. One user feels that Perkin-Elmer appears to be devoting most of its attention to the 32-bit line. ➤

➤ **PHYSICAL SPECIFICATIONS:** The Series Sixteen processors will operate in an environment having a temperature range of 32 to 120 degrees F. and a relative humidity of 5 to 95 percent, noncondensing. The primary power requirement is 115 or 230 VAC ± 10 percent, 47 to 63 Hertz, single-phase; 3.6 amperes minimum, 6 amperes maximum at 115 VAC or 1.5 amperes minimum, 3.5 amperes maximum at 230 VAC. The Series Sixteen processors dissipate approximately 2000 to 2300 BTU's per hour. No special air conditioning other than normal office levels is required. Antistatic flooring material is recommended. The basic Sixteen 10 and Sixteen 20 chassis weigh 67 pounds, and the Sixteen 30 chassis weighs 82 pounds.

INPUT/OUTPUT CONTROL

I/O CHANNELS: The Series Sixteen models come with an Extended Selector Channel which supports direct memory access (DMA) devices. Also standard is a buffered multiplexer bus for medium- and low-speed devices. The selector channel operates at up to 2.667 megabytes per second and can accommodate up to sixteen controllers, one of which can be active at any one time. Block transfer of data on the selector channel is accomplished by the use of two registers in the channel, one for the current memory address and the other for the final memory address. Operation over the multiplexer and selector channels may be in 8- or 16-bit parallel modes. Both channels operate on a request/response basis. All device controllers are connected on a party-line basis. The device closest to the CPU has the highest priority. This priority may be altered under program control.

The multiplexer bus buffer is used to expand the drive capability of the standard multiplexer bus. In the standard 8K-based processor, the multiplexer bus can drive up to nine device controllers before a multiplexer bus buffer is required. The 16KB-based twin-chassis multiplexer bus can drive up to 16 loads without the addition of a multiplexer bus buffer. The multiplexer bus buffer can also be used to extend the multiplexer bus to a "remote" chassis, up to 36 inches away. ➤

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➤ As can be determined from the comments and the survey results, the users' praise was for the hardware while criticism is aimed primarily at the software and documentation. However, none of the users seemed particularly dissatisfied, nor did any of them give the impression of regretting the choice of Perkin-Elmer and its equipment. □

➤ Multiple multiplexer bus configurations are permitted, with each multiplexer bus buffer having a drive capability of nine additional device controllers.

The I/O bus switch provides multiple-processor access to a common I/O bus or provides an extension medium to a remotely located bus chassis. Non-interfering multipoint access to the common bus allows only one processor to have unqualified control at any one time, thus preventing simultaneous access. When the switch is employed as a bus extender, all operation is performed in a transparent mode, with programmable features inhibited. When used as a bus extender, total load capability of the I/O bus switch common bus is 9 controllers. The addition of I/O bus switch (MBS-B) cards constitutes one controller load for each switch card interfaced to the common bus.

SIMULTANEOUS OPERATIONS: Both the DMA and selector channels operate on a cycle-stealing basis, competing with the processor for memory cycles.

CONFIGURATION RULES

The Series Sixteen processors' dual I/O bus architecture is capable of handling 255 peripheral devices for high-speed DMA (direct memory access) or lower-speed interrupt-driven devices.

The Sixteen 10 processor's memory sizes of 16K, 32K, or 64K bytes are implemented on a single board. Memory modules are field-expandable through the use of integrated memory strips on the basic memory control board in 16K- or 32K-byte increments. There are eight slots.

The Sixteen 20's maximum memory size of 256K bytes is available on a single board. The integral memory management hardware makes program addressing beyond 64K bytes possible by implementing additional bits in the Program Status Word. The optional Memory Protect Controller (MPC) permits selected blocks of memory to be write protected, read/write protected, or instruction execution protected. The Sixteen 20 processor has eight slots.

The Sixteen 30 has a 16-slot chassis and is designed for expansion by providing a 16-slot twin chassis. ECC MOS memory can be expanded up to 256K bytes in 32K-, 64K-, or 128K-byte increments.

System modules requiring one-half slot each include the line frequency derived clock, the universal clock module, the 8-line interrupt module, the loader storage unit controller, and the I/O bus switch (which also requires one-half slot in the switched bus chassis). Modules requiring one slot each include the general-purpose interface board, the universal logic interface, and the multiplexer bus buffer. Terminals, card readers, paper tape units, and printers require one-half slot. The 1600-bpi magnetic tape units require one-half slot, while all other magnetic tape and disk subsystems require one slot.

For Mini I/O subsystems, analog input requires one slot, analog output requires one-half slot, and digital I/O requires one-half slot.

MASS STORAGE

FMD-1 FLOPPY DISK SYSTEM: Uses standard 8-inch diskette media. Formatted capacity is 256,256 bytes. Average head positioning time is 325 milliseconds; track-to-track time is 6 milliseconds; and maximum positioning time is 462 milliseconds. Average rotational delay is 83 milliseconds. Rotational speed is 360 rpm, and the data transfer rate is 250K bytes per second. Track density is 48 tracks per inch. IBM format compatibility is provided through 77 tracks with 26 sectors per track, each sector containing 128 bytes.

The FMD-1 system utilizes microprocessor LSI technology to control all functions for up to four disk drives. The basic subsystem is available in four versions: M46-630 and M46-631 are single- and dual-drive systems, respectively, for use with a multiplexer bus; M46-632 and M46-633 are single- and dual-drive systems, respectively, for use with a microprocessor bus. Each system is expandable to a maximum of four disk drives for a total of 1,025,024 bytes of on-line storage. The 230V, 50 Hertz equivalents are, respectively, M46-636, M46-637, M46-638, and M46-639. The 60-Hertz second, third, and fourth expansion drives are M46-634, M46-635, and M46-643 while the 50 Hertz equivalents are M46-640, M46-641, and M46-644. The manufacturer is Perkin-Elmer Data Systems.

M46-617 10-MEGABYTE REMOVABLE CARTRIDGE DISK SYSTEM: Uses a 5-megabyte fixed disk and a removable IBM 5440-equivalent, 5-megabyte disk cartridge. Actual formatted drive capacity is 10,027,008 bytes. Average head positioning time for this toploading, 200-tpi drive is 35 milliseconds. Track to track head movement time is 10 milliseconds, and movement time across all tracks is 60 milliseconds. Average rotational delay is 12.5 milliseconds. There are 408 tracks per surface with 4 tracks per cylinder. Unformatted track capacity is 7812 bytes. Formatted track capacity is 6144 bytes divided into 24 sectors of 256 bytes each. Bit density is 2200 bpi. Rotational speed is 2400 rpm, and the data transfer rate is 312,500 bytes per second.

The basic system includes a single drive, controller, and disk cartridge. Up to three additional drives with built-in power supplies (M46-659) can be added to the basic controller. The M46-618 and M46-660 are the 230-volt versions of the M46-617 and M46-659, respectively. With 16-bit DMA included, the 60 Hertz drive is M46-655, while the 50 Hertz equivalent is M46-656. The M46-61X drives have hardware write protection as a standard feature. The manufacturer is Perkin-Elmer Data Systems.

M46-604 MSM300 256-MEGABYTE REMOVABLE MEDIA MASS STORAGE MODULE SUBSYSTEM: Uses a 3330-technology 12-platter disk pack. Ten of the 12 platters are used as recording surfaces, with 19 surfaces for data and the remaining surface for servo use. The other two platters are for protection, with one being located on top of the pack and the other on the bottom.

Each of the disk pack's 19 usable surfaces contains 808 data tracks plus 15 spares. Each cylinder is composed of 19 tracks. Track density is 384 tpi, while bit density is 6000 bpi. Unformatted track capacity is 20,160 bytes. Formatted track capacity is 16,384 bytes divided among 64 sectors of 256 bytes each. Unformatted drive capacity is 300 million bytes, but Perkin-Elmer's formatting limits the total drive capacity to 256 million bytes.

The basic system includes one MSM300 drive, a controller for up to four drives, and a removable disk pack. The add-on drive is the M46-605 Model MSM300E. The equivalent master and add-on 220-VAC, 50-Hertz drives are the M46-606 and M46-607, respectively. With 16-bit DMA included, the 60 Hertz drive is M46-679, while the 50 Hertz equivalent is M46-680.

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► The drives have a rotational speed of 3600 rpm, resulting in an average rotational delay of 8.3 milliseconds. Head positioning times are 10, 30, and 55 milliseconds for the track-to-track, average, and maximum head movements, respectively. The data transfer rate is 1.2 million bytes per second. The data security techniques described for the M46-600 below also apply to this subsystem.

M46-600 MSM80 67-MEGABYTE REMOVABLE MEDIA MASS STORAGE MODULE SUBSYSTEM: Uses a 3330-technology five-platter disk pack. Three of the five platters are employed for recording, with five surfaces for data and the sixth for servo use. As in the MSM300, the remaining two platters provide protection. The basic system includes one MSM80 drive, a controller for up to four drives, and a removable disk pack. The add-on drive is the M46-601 Model MSM80E. The 220-VAC, 50-Hertz versions of the master and add-on drives are the M46-602 and M46-603, respectively. With 16-bit DMA included, the 60 Hertz drive is M46-683, while the 50 Hertz equivalent is M46-684.

Bit density for the storage module is 6000 bpi, while track density is 384 tpi. There are 808 data tracks plus 15 spares per surface. Each cylinder contains five tracks. Unformatted track capacity is 20,160 bytes. Formatted track capacity is 16,384 bytes divided among 64 sectors of 256 bytes each. Drive capacity, based on formatted data, is 67,200,000 bytes; the unformatted capacity is 80 megabytes.

Track-to-track, average, and maximum head movement times are 6, 30, and 55 milliseconds, respectively. Average rotational delay is 8.3 milliseconds, based on a rotational speed of 3600 rpm. The data transfer rate is 1.2 million bytes per second.

Data security is provided by a write protect feature with positive manual control, electronically inhibiting write functions upon detection of seek errors, track position error, loss of rotational speed, or loss of voltage. The last two malfunctions also cause head retraction.

INPUT/OUTPUT UNITS

See Peripherals/Terminals table.

In addition to the conventional devices listed in the Peripherals/Terminals table, Perkin-Elmer offers a line of interface devices particularly useful in measurement and control applications. These devices are called Mini I/O.

A Mini I/O analog input subsystem includes up to 32 single-ended or 16 differential inputs operating at up to 20, 33, 40, or 75 kilohertz with a resolution of 10 or 12 bits. Options include four programmable system gain levels and an instrumentation amplifier, which enables the user to interface two low-level channels in addition to the high-level signals normally supported. All models include a sample and hold analog-to-digital converter.

An analog output subsystem provides two or four output channels with any of five preselected output voltage ranges up to +10.24 volts. Resolution is 12 bits. One model includes control signals for an oscilloscope.

A digital I/O subsystem provides 16 latched outputs (up to 50 volts) and interfaces 16 TTL, contact or voltage sense, digital inputs (4 to 50 volts).

Programming of the Mini I/O subsystems via Perkin-Elmer supervisory calls or ISA real-time extensions to FORTRAN IV is supported under OS/16.

COMMUNICATIONS CONTROL

The Perkin-Elmer 16-bit processors support three types of synchronous communications adapters, programmable

single- and multiple-line asynchronous communications adapters, and a programmable asynchronous multiple-line adapter with auto-call. Also, direct communication to an IBM System/360 or 370 processor, simulating a device attached as a 360/370 peripheral, is possible.

SYNCHRONOUS COMMUNICATIONS: The M47-000 Bell 201-type Data Set Adapter supports half- or full-duplex operation at speeds of up to 9600 bits per second. The M47-001 Bell 301-type Data Set Adapter is used for half- or full-duplex operation at speeds up to 50,000 bytes per second. Both adapters provide full data set control and double-character buffering. Speeds are set by straps. Parity checking (strappable odd or even) and automatic modem status checks (line ready, etc.) are standard. Transmission is serial synchronous by character and bit; any six-, seven-, or eight-bit character code may be used. The set interface is RS-232 compatible.

The QUAD Synchronous Adapter (QSA) is designed to interface a variety of data sets with either the processor I/O multiplexer bus or a selector channel. The QSA is mounted on a 15-inch board. Four communications line interfaces are provided; each can handle full- or half-duplex service. All modem control parameters are under program control. These include sync character and character length selection, flag insertion/deletion, and loopback capability. Strappable features include full or half duplex service for each line, deletion of all leading sync characters, automatic resynchronization of SDLC frame, and odd/even parity. Bell System 200 and 300 series data sets can be accommodated. The Perkin-Elmer part number for the QSA is M47-002.

Line Conditioning Modules (LCM's) provide the actual interface with the communications lines. There are two types. The M47-004 accommodates CCITT interfaces and future announcements. The M47-005 interfaces four RS-232C lines through two cable assemblies. Each LCM is mounted on a 7-by-15-inch board.

ASYNCHRONOUS COMMUNICATIONS: The M47-102 provides single-line asynchronous communications at speeds (one of two) that are program-selectable. Also program-selectable are the character length, stop bits, and parity. Respectively, these may be 5, 6, 7, or 8 bits; 1 or 2; and odd, even, or none; additionally, an echoplex check and line break are programmable. This Programmable Asynchronous Single Line Adapter (PASLA) handles switched or private lines and connects Bell 103 or 202 data sets or local RS-232 standard terminals. Operation is half or full duplex at speeds from 75 to 9600 bits per second, depending on the data set or terminal type attached.

For multi-line asynchronous communications without auto dial, Perkin-Elmer offers the M47-100 Asynchronous Line Module Controller (actually a multiplexer), which handles any four binary multiples of speeds (strapped in) from among the standard top speeds of 49, 75, 110, 134, 150, 300, 600, 1200, and 1800 bps, and which provides control and bussing for up to 23 M47-101 Programmable Asynchronous Line Modules. The M47-101's each provide four Bell 103 or 202-type data set interfaces, each of which is program-selectable to one of the four speeds as well as having the other programmable features mentioned for the M47-102 Single Line Adapter described above. These modules fit within an M47-021 Chassis. This system is known as the Programmable Asynchronous Line System (PALS).

For asynchronous communications with auto dialing, the M10-022 Automatic Dial Unit Controller is used to buffer, interface, and provide program control for a Bell 801 Auto Call Data Auxiliary Set. This unit permits dialing any number in the switched public network. It is a 4-line unit. ►

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► **LOCAL (PARALLEL) COMMUNICATIONS:** An IBM channel interface permits direct connection of a 16-bit Perkin-Elmer processor as an IBM System/360 or 370 peripheral device attached to a multiplexer (burst-mode device), selector, or block multiplexer channel on the 360 or 370. Model M47-202 responds to one System/360 or 370 address, while Model M47-203 responds to 256. Data transfer rates of up to 500,000 bytes per second are possible. Perkin-Elmer provides test software and IBM-type cable terminals, if required, and driver software. These interfaces do not support the IBM bus extension feature.

COMMUNICATIONS SOFTWARE: *The Integrated Telecommunications Access Method (ITAM/16)* runs under OS/16 and, according to the vendor, makes access to remote computers and terminals as easy as access to local peripherals. Included in the ITAM/16 package is IBM 2780/3780 RJE emulation capability.

A minimum system to support ITAM consists of a 16-bit series processor with 32K bytes, operator console panel, power-fail/auto restart option, real-time clock, console device, system load device, and appropriate communication line adapters. For synchronous lines, a Bell 201-type Data Set Adapter, single-line synchronous adapter, or Quad Synchronous Adapter is supported. Bell 103-type modems are supported at up to 300 bps. For asynchronous lines, either single or multi-line controllers are supported. Bell 201, 208, and 209-type modems are supported at 2400, 4800, and 9600 bps, respectively. Dataphone Digital Service (DDS) Data Service Units (DSU's) are supported to 9600 bps. Typically, OS/16 requires 16K bytes, with an additional 2K bytes for asynchronous support, 10K bytes for synchronous support, 5K bytes for an RJE emulator task, 200 bytes per device, and user-specified buffer areas.

ITAM supports device-dependent communications levels for sophisticated users who wish to develop their own terminal protocols, as well as a device-independent level that accesses remotely attached devices as if they were local peripherals. The latter level supports asynchronous ASCII devices, such as CRT's and teletypewriters, and also RJE (remote job entry) terminals to allow users to emulate IBM 2780 or 3780 remote terminals. The device-dependent level, meanwhile, includes asynchronous and binary synchronous modules that can be tailored by users to accommodate various networks, facilities, and protocols. Coding is sharable for multi-task environments.

HASP/16 can be used to turn any Perkin-Elmer 16-bit processor into a remote job entry station from which batch jobs can be submitted to a host IBM processor using binary synchronous communications protocol. Batch jobs can be processed by the host system and the results returned to the originating station for local storage or output. *HASP/16* supports both a host and alternate remote mode of operation which permits Perkin-Elmer 16-bit systems to communicate among themselves. *HASP/16* can be used with Perkin-Elmer's 32-bit systems and *HASP/32* for processor-to-processor communications permitting the formation of computer networks. *HASP/16* is a compatible subset of *HASP/32* and supports up to seven card readers and eight printing devices, a control console, and a dial-up or leased communications line operating at up to 19.2K bits per second. Multileaving or combining up to seven job streams in each direction over a single communications line allows concurrent operation of all card readers and printers.

SOFTWARE

OPERATING SYSTEM: OS/16 is currently supported for Perkin-Elmer's 16-bit processors, including Series Sixteen.

The OS/16 Operating System requires a 64K-byte memory for system generation. In normal operations, OS/16 provides

support for a system with a minimum of 16K bytes. The system must have a console terminal and binary input device. Disk facilities are optional. OS/16 is an event-driven, multi-programming, multi-tasking operating system that is a generally compatible subset of the 32-bit series operating system, OS/32. Disk files written under OS/16 are portable and can be read under OS/32 and vice versa as system files with account number 0. Features include multiple operations from one command, shared libraries, up to 16 interactive terminal users, overlay facilities, and file protection at the file and task level. Memory management facilities can handle up to 126 priority scheduled tasks with roll-in/roll-out, partitioned foreground and background environments, and task common and sharable library modules. Software support is provided for the CAL Assembler, BASIC and FORTRAN IV languages, and *HASP/16* and *ITAM/16* for data communications. The following software packages are provided with OS/16: OS/16 EDIT, OS EDIT, AIDS/16, OS Library Loader, OS COPY, and *CAL/16*, a subset of *CAL*.

LANGUAGES: Perkin-Elmer offers an assembler, FORTRAN, and BASIC.

The Common Assembly Language (CAL) is a cross-assembler. It can be run on either a 16-bit or 32-bit Perkin-Elmer processor and can produce object code that can in turn be executed directly on either a 16- or 32-bit machine. The minimum configuration for running *CAL* is a Perkin-Elmer 16-bit series processor with adequate storage for the operating system and symbol tables plus 24K additional bytes for the assembler, an operator's console panel, and a teletypewriter. A disk or magnetic tape is highly desirable with *CAL* as the symbol table can be paged to disk.

CAL is a two-pass assembler that incorporates a multi-pass machine-code optimizer which is invoked by the SQUEE (squeeze) command. *CAL* has a facility to process "common code," which is essentially similar to machine code but not specific to the processor architecture (16 or 32 bits). It provides an annotated cross-reference listing of symbolic references to aid in debugging programs.

CAL permits eight-character alphanumeric symbols, provides common block definition and initialization that is FORTRAN-compatible, and allows conditional assembly pseudo-operations. A companion program, the *CAL Macro Processor (MACROCAL)*, establishes and processes a library of macros. These may be positional or keyword prototypes, nested macros, variable operation codes, operand sublists, and conditional macro expansions.

Extended FORTRAN IV conforms to the ANSI FORTRAN Standard X3.9-1966. It can be utilized with OS/16. Perkin-Elmer extensions include mixed-mode arithmetic statements, implied DO loops, array initializations and hexadecimal constants in DATA statements, multiple entry into user-written subroutines, Hollerith string declarations, implicit type declarations, and error and end-of-file returns from read/write operations. In addition, real-time processing is supported according to the Purdue-ISA standards. A runtime library containing over 135 sharable, relocatable programs is supplied with the compiler. The compiler requires 16K bytes above the operating system, an operator console panel, and a teletypewriter.

BASIC Level II conforms to the conventions of Dartmouth's BASIC and operates on the 16-bit series processors under OS/16. It is a superset of Dartmouth BASIC that includes enhanced I/O facilities, string and matrix extensions, and user-defined arithmetic functions. Enhancements to the I/O facilities include file manipulation completely from within the BASIC program. String and matrix extensions include matrix arithmetic performed within the BASIC program, subscripting either end of a variable-length string, and subscript deletion. ►

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The 1615 System, low end of Perkin-Elmer's Series Sixteen, has from 32K to 64K bytes of parity MOS memory, multiply/divide and list processing instructions, 255 hardware-vectorized interrupts, and an eight-slot chassis. Available peripherals include a 512K-byte floppy disk drive, a Model 550 video display unit, and a Model 655 thermal page printer.

- Both single- and double-precision arithmetic operations can be handled. Single precision to six digits of significance and double precision to 14 significant digits are standard.

BASIC Level II requires 19K bytes of memory beyond the operating system plus a minimum of 1K bytes per user. Also required are an operator console panel, which may be either a binary or hex display, an operator command console, and a magnetic medium. The command console may be either a teletypewriter or display terminal. The magnetic medium may be a cassette tape, 9-track magnetic tape, 2.5-megabyte cartridge disk, or 10-megabyte cartridge disk drive.

UTILITIES: Two major OS utilities are available, OS/16 Edit and OS AIDS.

OS/16 Edit is a fairly flexible editor for ASCII and/or binary characters that runs under OS/16. It is basically line-oriented, but it also has facilities for character and column manipulation. A string search and replacement capability is also provided. OS/16 Edit can be used for interactive editing or batch-stream job editing, and it has file manipulation capabilities. Text is read into an edit buffer in memory that is at least 1K bytes in size; it can be made larger by operator request. OS/16 Edit is included at no charge with OS/16.

OS AIDS (Automatic Interactive Debugging System) has breakpoint, snapshot, and trace facilities, and also a memory cell or register monitor feature. It operates in interactive or batch mode. It is included at no charge with OS/16.

APPLICATION PROGRAMS: Application programs for Perkin-Elmer systems are generally available through the Perkin-Elmer users' group, Interchange. Programs from Interchange are nominal in cost. For information, write Perkin-Elmer's headquarters. There are similar groups outside the U.S. as well.

In addition to the packages listed in the Software Price section, Perkin-Elmer offers about 39 diagnostic/test programs at \$25 to \$50 each. Also available are 13 software routines at \$25 to \$55 each plus media costs of up to \$75.

PRICING

POLICY: Perkin-Elmer offers its systems on a purchase-only basis, with customer service provided. Field installations are performed by Customer Service on a fixed-price basis. Since system configurations and customers' locations vary, rates are provided on a quotation basis only. Customer Service must be contacted for a formal quotation on all such installations. A minimum installation charge of \$200.00 plus the travel charge is applicable. Installation consists of functional, operational testing and system performance as demonstrated by Perkin-Elmer's applicable test programs. This service must be ordered prior to shipment of the equipment. A full on-site service warranty applies for 90 days from installation date.

The Perkin-Elmer Customer Service Division is organized to provide comprehensive maintenance service. The field force is supported by a staff of service specialists at Perkin-Elmer's national headquarters in Neptune, New Jersey, and at support depots in Flanders, New Jersey, and Garden Grove, California. Customer engineers are located in major cities throughout the United States to provide service on a local level. Each service office is stocked with spare parts, tools, and special test equipment to facilitate repairs.

Maintenance service can be obtained: 1) on a contract basis, with fixed monthly charges to cover the normal business week up to and including 24 hours a day, seven days a week at most locations, 2) on a full-time, on-site basis, 3) via a depot and fixed-rate exchange service, which provides users with repairs and exchange parts at predetermined rates, or 4) on a per-request basis, which provides service at hourly rates.

Training is offered on both software and hardware topics in a number of courses. For information regarding course content, location, and pre-requisites, contact the Technical Training Center in Neptune, New Jersey, (201) 988-0400. Information regarding on-site training courses is also available. Software courses include Introduction to Assembly Language, OS/16 I/O Subsystems, ITAM/16, COBOL, ►

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► **FORTRAN, and OS/16 Operations.** Hardware maintenance courses include Introduction to Computer Hardware, System Diagnosis/PM, Series Sixteen, and a number of courses on peripheral maintenance.

Both hardware and software subscription services are offered by Perkin-Elmer at \$200 per year. The hardware service entitles a Perkin-Elmer user to receive product improvement notices, general information bulletins, and preventive maintenance procedures. The software service brings a user

regular software bulletins describing new Perkin-Elmer software, software defects, and the patches or alternatives associated with such defects. Revisions to previously purchased software are available at reduced rates.

Software is separately priced.

Quantity discounts of 10 to 38 percent are provided on Series Sixteen systems in quantities up to 100 systems; additional discounts are available for larger orders.■

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.
PROCESSORS			
M16-100	Sixteen 10 with 16K bytes of parity memory, 8-slot chassis	\$ 5,400	\$ 40
M16-101	Same as M16-100 with 32K bytes	5,600	55
M16-200	Sixteen 20 with 32K bytes of parity memory, 8-slot chassis	9,000	70
M16-201	Same as M16-200 with 64K bytes	10,000	85
M16-202	Same as M16-200 with 128K bytes	11,000	95
M16-203	Same as M16-200 with 256K bytes	15,000	120
M16-300	Sixteen 30 with 32K bytes of ECC MOS memory, 16-slot chassis	11,500	80
M16-301	Same as M16-300 with 64K bytes	12,500	95
M16-302	Same as M16-300 with 128K bytes	13,500	105
M16-303	Same as M16-300 with 256K bytes	17,500	130
SYSTEMS			
M16-715	1615 System, 60 Hertz, with 32K bytes of MOS parity memory, dual floppy drives, Model 550 video display unit, Model 655 printer, serial I/O port, 8-slot chassis, 50-amp. power supply, memory processor integrity test, power fail/auto restart, 6-minute battery back-up, auto loader, control panel, OS/16 operating system and utilities, 28-inch cabinet	12,750	120
M16-716	50 Hertz version of M16-715	12,850	*
M16-720	1624 System, 60 Hertz, with 64K bytes of MOS parity memory, CP 120-character printer; otherwise, includes all features of M16-715	17,700	160
M16-721	50 Hertz version of M16-720	17,700	*
M16-725	1625 System, 60 Hertz, with 10-megabyte disk system in lieu of dual floppy drives, and 56-inch cabinet; otherwise, includes all features of M16-720	24,250	220
M16-726	50 Hertz version of M16-725	24,250	*
M16-735	1635 System, 60 Hertz, with 128K bytes of ECC MOS memory, 16-slot chassis, and CP 180-character printer in lieu of 120-character printer; otherwise, includes all features of M16-725	29,500	250
M16-736	50 Hertz version of M16-735	29,500	*
PROCESSOR OPTIONS			
M16-820	Upgrade Sixteen 10 (1615) to Sixteen 20 (1624 and 1625)	5,000	*
M16-800	Battery backup, MOS memory, 20 minutes	250	2
M16-801	Battery backup, MOS memory, 120 minutes	750	10
M16-802	Signed fixed-point multiply/divide hardware	500	5
M16-803	Single-precision floating-point hardware	2,700	20
M16-804	Single/double-precision floating-point hardware	2,800	20
M16-805	Memory protect unit	500	3
M16-806	Extended Memory Selector Channel	1,000	10
M16-807	System Expansion Chassis	1,000	—
M16-808	1K-byte Read-Only Memory/Auto Load	100	—
M16-809	2K-byte Read-Only Memory/Auto Load	150	—
M16-810	50 amp., 230V Power Option	100	—
M49-053	50 amp., 115V MOS expansion power supply	1,500	15
M49-054	50 amp., 230V MOS expansion power supply	1,500	15
MEMORY			
M16-150	16K bytes 900-nanosecond MOS memory expansion with parity (for 1615 only)	1,600	10
M16-151	32K bytes 900-nanosecond MOS memory expansion with parity (for 1615 only)	2,000	15
M16-250	32K bytes 900-nanosecond MOS memory expansion with parity (for 1624 or 1625)	2,000	15
M16-251	64K bytes 900-nanosecond MOS memory expansion with parity (for 1624 or 1625)	3,000	30
M16-252	128K bytes 900-nanosecond MOS memory expansion with parity (for 1624 or 1625)	4,500	35
M16-350	32K bytes 750-nanosecond MOS ECC memory expansion (for 1635)	2,000	15
M16-351	64K bytes 750-nanosecond MOS ECC memory expansion (for 1635)	3,000	30
M16-352	128K bytes 750-nanosecond MOS ECC memory expansion (for 1635)	4,500	35
SYSTEMS MODULES			
M48-062	Universal Clock Module; includes a programmable precision interval clock with both frequency and interval count under hardware control and an AC line frequency-derived clock	750	5
M48-001	8-Line Interrupt Module; to interface customer interrupt lines to the built-in processor interrupt system	900	5
M48-002	General Purpose Interface Board, mounts up to 117 14- or 16-pin dual in-line package IC's for custom design	550	—
M48-013	Universal Logic Interface; mounts up to 77 14- or 16-pin dual in-line package IC's for custom design; includes fully buffered logic for 8- and 16-bit transfers on multiplexer bus or selector channel	700	—
M48-055	I/O Switch	1,700	20
M48-018	Manual Control Panel for I/O Switch; manual override control for up to six processors sharing a single common switched bus	200	—
M48-019	Manual Control Panel for I/O Switch; manual override control for up to three separate common switched buses, each shared by two processors	200	—

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.
MASS STORAGE			
M46-617	10-megabyte Fixed/Removable Cartridge Disk System; includes drive, controller for up to four drives, power supply, and disk cartridge	10,000	90
M46-618	50 Hertz version of M46-617	10,100	*
M46-655	Same as M46-617 plus 16-bit DMA	10,900	100
M46-656	50 Hertz version of M46-655	10,900	*
M46-661	Same as M46-655 plus second drive	17,900	160
M46-662	50 Hertz version of M46-661	17,900	*
M46-659	10-megabyte add-on Fixed/Removable Cartridge Disk Drive	7,000	60
M46-660	50 Hertz version of M46-659	7,000	*
M46-421	Cartridge Disk Drive Interface for up to four drives	4,800	30
27-056	IBM 5440-type 10-megabyte Disk Cartridge	270	—
M46-600	MSM 80 80-megabyte Removable Media Mass Storage Module System; includes a drive, controller, and interface for up to four drives, power supply, and disk pack	22,000	195
M46-602	50 Hertz version of M46-600	22,000	*
M46-683	MSM 80/16; same as M46-600 plus 16-bit DMA	23,000	205
M46-684	50 Hertz version of M46-683	23,000	*
M46-601	MSM 80E 80-megabyte add-on Removable Media Mass Storage Module Drive	18,000	145
M46-603	50 Hertz version of M46-601	18,000	*
M46-609	Formatted 80-megabyte, 5-platter disk pack	750	—
M46-604	MSM 300 300-megabyte Removable Media Mass Storage Module System; includes a drive, controller, and interface for up to four drives, power supply, and disk pack	35,000	295
M46-606	50 Hertz version of M46-604	35,000	*
M46-679	MSM 300/16; same as M46-604 plus 16-bit DMA	36,000	305
M46-680	50 Hertz version of M46-679	36,000	*
M46-605	MSM 300E 300-megabyte add-on Removable Media Mass Storage Module Drive	32,750	225
M46-607	50 Hertz version of M46-605	32,750	*
M46-610	Formatted 300-megabyte, 12-platter disk pack	1,700	—
M46-630	FMD-1 Floppy Disk System; includes a 256-byte disk drive, controller for up to four drives, power supply, and chassis; for use with multiplexer bus of any 16-bit Perkin-Elmer computer	2,900	29
M46-632	Same as M46-630 for use with microprocessor bus connection	2,900	29
M46-636	50 Hertz version of M46-630	2,900	*
M46-638	50 Hertz version of M46-632	2,900	*
M46-631	Same as M46-630 plus second drive	3,900	39
M46-633	Same as M46-631 for use with microprocessor bus connection	3,900	39
M46-637	50 Hertz version of M46-631	3,900	*
M46-639	50 Hertz version of M46-633	3,900	*
M46-634	Second drive for M46-630, -632	1,000	10
M46-640	50 Hertz version of M46-634	1,000	*
M46-635	Third drive for M46-630 thru -633	2,400	24
M46-641	Third drive for M46-636 thru -639	2,400	*
M46-643	Fourth drive for M46-635	1,000	10
M46-644	Fourth drive for M46-641	1,000	*
M46-642	FMD-1 Diskette, package of 10	120	—
MAGNETIC TAPE EQUIPMENT			
M46-490	9-track, 800-bpi, 75-ips Magnetic Tape System; includes master drive and controller for up to four drives; 60 Hertz	9,100	115
M46-492	50 Hertz version of M46-490	9,100	*
M46-494	9-track, 800/1600-bpi, 75-ips Magnetic Tape System; includes master drive, NRZI/PE formatter, and controller for up to four drives; 60 Hertz	19,100	140
M46-496	50 Hertz version of M46-494	19,100	*
M46-532	Same as M46-490 plus 16-bit DMA; 115V	10,000	125
M46-533	230V version of M46-532	10,000	*
M46-536	Same as M46-494 plus 16-bit DMA; 115V	20,000	150
M46-537	230V version of M46-536	20,100	*
M46-491	Add-on drive for M46-490, -532	8,425	90
M46-493	Add-on drive for M46-492, -533	8,425	*
M46-495	Add-on drive for M46-494, -536	9,625	100
M46-497	Add-on drive for M46-496, -537	9,625	*
M46-524	9-track, 800-bpi, 45-ips Magnetic Tape System; includes master drive, NRZI formatter, controller for up to four drives, and 16-bit DMA; 115V	8,000	100
M46-525	230V version of M46-524	8,100	*
M46-528	9-track, 1600-bpi, 45-ips Magnetic Tape System; includes master drive, PE formatter, controller for up to four drives, and 16-bit DMA; 115V	10,000	110
M46-529	230V version of M46-528	10,100	*
M46-501	Add-on drive for M46-524	5,300	70
M46-502	Add-on drive for M46-525	5,300	*
M46-515	Add-on drive for M46-528	5,900	80
M46-516	Add-on drive for M46-529	6,000	*
M46-500	Interface/Controller for up to four 9-track, 800-bpi, 45-ips drives	2,500	20
M46-517	Controller for up to four 9-track, 1600 bpi, 45-ips drives, 115V	5,500	*
M46-518	230V version of M46-517	5,500	—
PRINTERS			
M46-221	CP 120 matrix printer; 96 USASCII character set, 45 to 255 lpm; 115V, 50/60 Hertz	3,500	45
M46-222	230V version of M46-221	3,500	*
M46-223	CP 180 matrix printer; 96 USASCII character set, 70 to 300 lpm; 115V, 50/60 Hertz	5,500	55
M46-224	230V version of M46-223	5,500	*
M46-233	CP printer interface and cable	800	10
M46-227	U.K. character set with form length control; for M46-221 thru -224	100	—
M46-229	French character version of M46-227	100	—
M46-230	German character version of M46-227	100	—
M46-232	Printer ribbons, case of 12	60	—
M46-845	Pedestal mount	195	—

*Requires special Customer Service quotation.

Perkin-Elmer Series Sixteen

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.
PRINTERS (Continued)			
M46-300	LP 300 line printer; 132 positions, 300 lpm, without character band; with interface and cables; 90-132V, 60 Hertz	9,000	105
M46-301	50 Hertz version of M46-300	9,000	*
M46-302	180-250V, 60 Hertz version of M46-300	9,000	105
M46-303	50 Hertz version of M46-302	9,000	*
M46-312	USASCII 64-character set for 300-lpm printers	750	—
M46-313	USASCII 96-character set for 300-lpm printers	750	—
M46-314	U.K. 96-character set for 300-lpm printers	750	—
M46-316	German 96-character set for 300-lpm printers	750	—
M46-304	600-lpm version of M46-300	13,000	125
M46-305	600-lpm version of M46-301	13,000	*
M46-306	600-lpm version of M46-302	13,000	125
M46-307	600-lpm version of M46-303	13,000	*
M46-319	USASCII 64-character set for 600-lpm printers	750	—
M46-320	USASCII 96-character set for 600-lpm printers	750	—
M46-321	U.K. 96-character set for 600-lpm printers	750	—
M46-323	German 96-character set for 600-lpm printers	750	—
M46-309	Pedestal and paper shelf for line printers in stand-alone floor installations	500	—
M46-310	Acoustical package for line printers, includes pedestal	1,000	—
M46-311	Ribbons for line printers, package of six	80	—
PUNCHED CARD EQUIPMENT			
M46-234	Hollerith to ASCII conversion	350	—
M46-238	Reader; 400 cpm	4,000	40
M46-239	50 Hertz version of M46-238	4,100	*
M46-236	Reader; 1,000 cpm	8,000	80
M46-237	50 Hertz version of M46-236	8,100	*
M46-235	Interface/Controller for card readers	990	10
TERMINALS			
M46-810	Cable Connection to PASLA	60	—
M46-811	Cable Connection to Bell 103 modem	60	—
M46-041	Model 1200 Video Display Unit, 1920 characters, 128-character ASCII set, full buffered, editing controls, numeric pad, page and conversational modes; speed to 9600 bits per second via RS-232C line interface; 60 Hertz	2,322	24
M46-042	50 Hertz version of M46-041	2,394	*
M46-046	Same as M46-041 but with function key set with 32 discrete function codes	2,435	24
M46-048	50 Hertz version of M46-046	2,507	*
M46-044	1200 printer port for local hard copy device, RS-232C; must be ordered with display unit	131	—
M46-045	20ma current loop version of M46-044	164	—
M46-050	1200 line drawing character set to permit form and graph screen formats; must be ordered with display unit	106	—
M46-066	Model 650 thermal page printer; prints 1920-character screen in 20 seconds; USASCII 96-character set and special forms drawing; 115V, 50/60 Hertz	1,327	14
M46-067	230V, 50/60 Hertz power option for M46-066; includes AC line cord	50	—
M46-068	100V version of M46-066	1,377	*
M46-110	Model 550 video display unit; anti-glare screen, RS-232C connection; 115V, 60 Hertz; includes external cable	1,096	16
M46-111	Same as M46-110 but with printer port for Model 655	1,170	16
M46-112	230V, 50/60 Hertz version of M46-111	1,250	*
M46-113	115V, 50/60 Hertz version of M46-111	1,250	*
M46-114	110V, 50/60 Hertz version of M46-111	1,250	*
M46-115	Model 550 20ma current loop interface	80	—
M46-116	Model 550 French character set; must be ordered with Model 550	100	—
M46-117	Swedish character version of M46-116	100	—
M46-118	Danish character version of M46-116	100	—
M46-119	German character version of M46-116	100	—
M46-120	U.K. character version of M46-116	100	—
M46-080	Model 655 thermal printer; prints 1920-character screen in 20 seconds; USASCII 96-character set; 115V, 50/60 Hertz	1,327	14
M46-081	230V, 50/60 Hertz power option for M46-080; includes AC line cord	50	—
M46-082	100V, 50/60 Hertz version of M46-080	1,377	*
M46-069	Model 650 optional buffer; additional 1920-character buffer for multi-page printing	150	N/A
M46-071	French character set for thermal printer; must be ordered with Model 650 or 655 thermal printer	100	—
M46-072	Swedish character version of M46-071	100	—
M46-073	Danish character version of M46-071	100	—
M46-074	German character version of M46-071	100	—
M46-075	U.K. character version of M46-071	100	—
M46-070	Thermal printer paper, case of 12 250-foot rolls, 8.5 inches wide, prints black	69	—
COMMUNICATIONS EQUIPMENT			
M47-000	Adapter for Bell 201-type data sets, synchronous	1,200	10
M47-001	Adapter for Bell 301-type data sets, synchronous	1,400	10
M47-106	Single line synchronous adapter	1,200	10
M47-002	QUAD synchronous adapter (QSA)	1,600	30
M47-004	Line Conditioning Module with interface for QSA and two CCITT modems	700	20
M47-005	Line Conditioning Module with interface for QSA and four RS-232C communications lines	400	10
M47-102	Programmable Asynchronous Single Line (PASLA) Adapter (103/202 data sets of RS-232)	500	10
M47-100	Asynchronous Line Module Controller (for M47-101)	500	10
M47-101	Programmable Asynchronous Line Module (4 lines)	1,200	10

*Requires special Customer Service quotation.

N/A—Information not available.

Perkin-Elmer Series Sixteen

EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>
MASS STORAGE			
M46-617	10-megabyte Fixed/Removable Cartridge Disk System; includes drive, controller for up to four drives, power supply, and disk cartridge	10,000	90
M46-618	50 Hertz version of M46-617	10,100	*
M46-655	Same as M46-617 plus 16-bit DMA	10,900	100
M46-656	50 Hertz version of M46-655	10,900	*
M46-661	Same as M46-655 plus second drive	17,900	160
M46-662	50 Hertz version of M46-661	17,900	*
M46-659	10-megabyte add-on Fixed/Removable Cartridge Disk Drive	7,000	60
M46-660	50 Hertz version of M46-659	7,000	*
M46-421	Cartridge Disk Drive Interface for up to four drives	4,800	30
27-056	IBM 5440-type 10-megabyte Disk Cartridge	270	—
M46-600	MSM 80 80-megabyte Removable Media Mass Storage Module System; includes a drive, controller, and interface for up to four drives, power supply, and disk pack	22,000	195
M46-602	50 Hertz version of M46-600	22,000	*
M46-683	MSM 80/16; same as M46-600 plus 16-bit DMA	23,000	205
M46-684	50 Hertz version of M46-683	23,000	*
M46-601	MSM 80E 80-megabyte add-on Removable Media Mass Storage Module Drive	18,000	145
M46-603	50 Hertz version of M46-601	18,000	*
M46-609	Formatted 80-megabyte, 5-platter disk pack	750	—
M46-604	MSM 300 300-megabyte Removable Media Mass Storage Module System; includes a drive, controller, and interface for up to four drives, power supply, and disk pack	35,000	295
M46-606	50 Hertz version of M46-604	35,000	*
M46-679	MSM 300/16; same as M46-604 plus 16-bit DMA	36,000	305
M46-680	50 Hertz version of M46-679	36,000	*
M46-605	MSM 300E 300-megabyte add-on Removable Media Mass Storage Module Drive	32,750	225
M46-607	50 Hertz version of M46-605	32,750	*
M46-610	Formatted 300-megabyte, 12-platter disk pack	1,700	—
M46-630	FMD-1 Floppy Disk System; includes a 256-byte disk drive, controller for up to four drives, power supply, and chassis; for use with multiplexer bus of any 16-bit Perkin-Elmer computer	2,900	29
M46-632	Same as M46-630 for use with microprocessor bus connection	2,900	29
M46-636	50 Hertz version of M46-630	2,900	*
M46-638	50 Hertz version of M46-632	2,900	*
M46-631	Same as M46-630 plus second drive	3,900	39
M46-633	Same as M46-631 for use with microprocessor bus connection	3,900	39
M46-637	50 Hertz version of M46-631	3,900	*
M46-639	50 Hertz version of M46-633	3,900	*
M46-634	Second drive for M46-630, -632	1,000	10
M46-640	50 Hertz version of M46-634	1,000	*
M46-635	Third drive for M46-630 thru -633	2,400	24
M46-641	Third drive for M46-636 thru -639	2,400	*
M46-643	Fourth drive for M46-635	1,000	10
M46-644	Fourth drive for M46-641	1,000	*
M46-642	FMD-1 Diskette, package of 10	120	—
MAGNETIC TAPE EQUIPMENT			
M46-490	9-track, 800-bpi, 75-ips Magnetic Tape System; includes master drive and controller for up to four drives; 60 Hertz	9,100	115
M46-492	50 Hertz version of M46-490	9,100	*
M46-494	9-track, 800/1600-bpi, 75-ips Magnetic Tape System; includes master drive, NRZI/PE formatter, and controller for up to four drives; 60 Hertz	19,100	140
M46-496	50 Hertz version of M46-494	19,100	*
M46-532	Same as M46-490 plus 16-bit DMA; 115V	10,000	125
M46-533	230V version of M46-532	10,000	*
M46-536	Same as M46-494 plus 16-bit DMA; 115V	20,000	150
M46-537	230V version of M46-536	20,100	*
M46-491	Add-on drive for M46-490, -532	8,425	90
M46-493	Add-on drive for M46-492, -533	8,425	*
M46-495	Add-on drive for M46-494, -536	9,625	100
M46-497	Add-on drive for M46-496, -537	9,625	*
M46-524	9-track, 800-bpi, 45-ips Magnetic Tape System; includes master drive, NRZI formatter, controller for up to four drives, and 16-bit DMA; 115V	8,000	100
M46-525	230V version of M46-524	8,100	*
M46-528	9-track, 1600-bpi, 45-ips Magnetic Tape System; includes master drive, PE formatter, controller for up to four drives, and 16-bit DMA; 115V	10,000	110
M46-529	230V version of M46-528	10,100	*
M46-501	Add-on drive for M46-524	5,300	70
M46-502	Add-on drive for M46-525	5,300	*
M46-515	Add-on drive for M46-528	5,900	80
M46-516	Add-on drive for M46-529	6,000	*
M46-500	Interface/Controller for up to four 9-track, 800-bpi, 45-ips drives	2,500	20
M46-517	Controller for up to four 9-track, 1600 bpi, 45-ips drives, 115V	5,500	*
M46-518	230V version of M46-517	5,500	—
PRINTERS			
M46-221	CP 120 matrix printer; 96 USASCII character set, 45 to 255 lpm; 115V, 50/60 Hertz	3,500	45
M46-222	230V version of M46-221	3,500	*
M46-223	CP 180 matrix printer; 96 USASCII character set, 70 to 300 lpm; 115V, 50/60 Hertz	5,500	55
M46-224	230V version of M46-223	5,500	*
M46-233	CP printer interface and cable	800	10
M46-227	U.K. character set with form length control; for M46-221 thru -224	100	—
M46-229	French character version of M46-227	100	—
M46-230	German character version of M46-227	100	—
M46-232	Printer ribbons, case of 12	60	—
M46-845	Pedestal mount	195	—

*Requires special Customer Service quotation.

Perkin-Elmer Series Sixteen

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.
PRINTERS (Continued)			
M46-300	LP 300 line printer; 132 positions, 300 lpm, without character band; with interface and cables; 90-132V, 60 Hertz	9,000	105
M46-301	50 Hertz version of M46-300	9,000	*
M46-302	180-250V, 60 Hertz version of M46-300	9,000	105
M46-303	50 Hertz version of M46-302	9,000	*
M46-312	USASCII 64-character set for 300-lpm printers	750	—
M46-313	USASCII 96-character set for 300-lpm printers	750	—
M46-314	U.K. 96-character set for 300-lpm printers	750	—
M46-316	German 96-character set for 300-lpm printers	750	—
M46-304	600-lpm version of M46-300	13,000	125
M46-305	600-lpm version of M46-301	13,000	*
M46-306	600-lpm version of M46-302	13,000	125
M46-307	600-lpm version of M46-303	13,000	*
M46-319	USASCII 64-character set for 600-lpm printers	750	—
M46-320	USASCII 96-character set for 600-lpm printers	750	—
M46-321	U.K. 96-character set for 600-lpm printers	750	—
M46-323	German 96-character set for 600-lpm printers	750	—
M46-309	Pedestal and paper shelf for line printers in stand-alone floor installations	500	—
M46-310	Acoustical package for line printers, includes pedestal	1,000	—
M46-311	Ribbons for line printers, package of six	80	—
PUNCHED CARD EQUIPMENT			
M46-234	Hollerith to ASCII conversion	350	—
M46-238	Reader: 400 cpm	4,000	40
M46-239	50 Hertz version of M46-238	4,100	*
M46-236	Reader; 1,000 cpm	8,000	80
M46-237	50 Hertz version of M46-236	8,100	*
M46-235	Interface/Controller for card readers	990	10
TERMINALS			
M46-810	Cable Connection to PASLA	60	—
M46-811	Cable Connection to Bell 103 modem	60	—
M46-041	Model 1200 Video Display Unit, 1920 characters, 128-character ASCII set, full buffered, editing controls, numeric pad, page and conversational modes; speed to 9600 bits per second via RS-232C line interface; 60 Hertz	2,322	24
M46-042	50 Hertz version of M46-041	2,394	*
M46-046	Same as M46-041 but with function key set with 32 discrete function codes	2,435	24
M46-048	50 Hertz version of M46-046	2,507	*
M46-044	1200 printer port for local hard copy device, RS-232C; must be ordered with display unit	131	—
M46-045	20ma current loop version of M46-044	164	—
M46-050	1200 line drawing character set to permit form and graph screen formats; must be ordered with display unit	106	—
M46-066	Model 650 thermal page printer; prints 1920-character screen in 20 seconds; USASCII 96-character set and special forms drawing; 115V, 50/60 Hertz	1,327	14
M46-067	230V, 50/60 Hertz power option for M46-066; includes AC line cord	50	—
M46-068	100V version of M46-066	1,377	*
M46-110	Model 550 video display unit; anti-glare screen, RS-232C connection; 115V, 60 Hertz; includes external cable	1,096	16
M46-111	Same as M46-110 but with printer port for Model 655	1,170	16
M46-112	230V, 50/60 Hertz version of M46-111	1,250	*
M46-113	115V, 50/60 Hertz version of M46-111	1,250	*
M46-114	110V, 50/60 Hertz version of M46-111	1,250	*
M46-115	Model 550 20ma current loop interface	80	—
M46-116	Model 550 French character set; must be ordered with Model 550	100	—
M46-117	Swedish character version of M46-116	100	—
M46-118	Danish character version of M46-116	100	—
M46-119	German character version of M46-116	100	—
M46-120	U.K. character version of M46-116	100	—
M46-080	Model 655 thermal printer; prints 1920-character screen in 20 seconds; USASCII 96-character set; 115V, 50/60 Hertz	1,327	14
M46-081	230V, 50/60 Hertz power option for M46-080; includes AC line cord	50	—
M46-082	100V, 50/60 Hertz version of M46-080	1,377	*
M46-069	Model 650 optional buffer; additional 1920-character buffer for multi-page printing	150	N/A
M46-071	French character set for thermal printer; must be ordered with Model 650 or 655 thermal printer	100	—
M46-072	Swedish character version of M46-071	100	—
M46-073	Danish character version of M46-071	100	—
M46-074	German character version of M46-071	100	—
M46-075	U.K. character version of M46-071	100	—
M46-070	Thermal printer paper, case of 12 250-foot rolls, 8.5 inches wide, prints black	69	—
COMMUNICATIONS EQUIPMENT			
M47-000	Adapter for Bell 201-type data sets, synchronous	1,200	10
M47-001	Adapter for Bell 301-type data sets, synchronous	1,400	10
M47-106	Single line synchronous adapter	1,200	10
M47-002	QUAD synchronous adapter (QSA)	1,600	30
M47-004	Line Conditioning Module with interface for QSA and two CCITT modems	700	20
M47-005	Line Conditioning Module with interface for QSA and four RS-232C communications lines	400	10
M47-102	Programmable Asynchronous Single Line (PASLA) Adapter (103/202 data sets of RS-232)	500	10
M47-100	Asynchronous Line Module Controller (for M47-101)	500	10
M47-101	Programmable Asynchronous Line Module (4 lines)	1,200	10

*Requires special Customer Service quotation.

N/A—Information not available.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.
COMMUNICATIONS EQUIPMENT (Continued)			
M49-021	Chassis for M47-101	550	—
M47-104	2-line Communication Multiplexer	700	15
M47-105	8-line Communication Multiplexer	2,000	30
M10-022	Automatic Dial Unit Controller (4 lines)	1,600	10
M47-202	Single-Address System, 360/370 Parallel Interface	5,000	100
M47-203	Multiple-Address System, 360/370 Parallel Interface	6,500	100
CABINETS & CHASSIS			
M49-115	Single pedestal, beige, w/o power	250	—
M49-118	Double pedestal, beige, 115V	460	—
M49-119	Double pedestal, beige 230V	460	—
M49-100	28-inch cabinet, beige, 115V	600	—
M49-101	28-inch cabinet, beige, 230V	600	—
M49-107	56-inch cabinet, beige, w/o power	1,100	—
M49-041	24-amp AC Distribution Panel; for 115V, 50/60 Hertz, 1-phase power; included with M49-107	150	—
M49-042	48-amp AC Distribution Panel; for 115/230V, 50/60 Hertz, 2-phase power; included with M49-107	200	—
M49-043	25-amp AC Distribution Panel; for 230V, 50 Hertz, 1-phase power; included with M49-107	150	—
POWER SUPPLIES			
M49-053	50-amp MOS expansion power supply; 115V, 50/60 Hertz, +5 VDC	1,500	15
M49-054	50-amp MOS expansion power supply; 230V, 50/60 Hertz, +5 VDC	1,500	15

SOFTWARE PRICES

		Purchase Price
OS/16 Operating System —		
S90-010-99	Documentation Package	\$ 200
S90-010-36	On 9-track, 800-bpi tape	1,400
S90-010-76	On 9-track, 1600-bpi tape	1,400
S90-010-66	On 10-megabyte disk	1,700
S90-010-86	On floppy disk	1,400
S90-905	System installation	1,000
OS/16 Custom SYSGEN —		
S90-012-36	On 9-track, 800-bpi tape	325
S90-012-76	On 9-track, 1600-bpi tape	325
S90-012-66	On 10-megabyte disk	325
Integrated Telecommunications Access Method — ITAM/16 —		
S90-011-99	Documentation Package	100
S90-011-36	On 9-track, 800-bpi tape	800
S90-011-76	On 9-track, 1600-bpi tape	800
S90-011-66	On 10-megabyte disk	1,100
S90-011-86	On floppy disk	800
S90-011-96	Source listing	200
Extended FORTRAN IV —		
S90-200-99	Documentation Package	25
S90-200-36	On 9-track, 800-bpi tape	250
S90-200-76	On 9-track, 1600-bpi tape	250
S90-200-66	On 10-megabyte disk	550
S90-200-86	On floppy disk	250
BASIC II —		
S90-208-99	Documentation Package	25
S90-208-39	Source only on 9-track, 800-bpi tape	2,000
S90-208-79	Source only on 9-track, 1600-bpi tape	2,000
S90-208-69	Source only on 10-megabyte disk	2,000
BASIC II Single-precision floating-point —		
S90-208-36	On 9-track, 800-bpi tape	400
S90-208-76	On 9-track, 1600 bpi tape	400
S90-208-66	On 10-megabyte disk	450
S90-208-86	On floppy disk	400
BASIC II Double-precision floating-point —		
S90-209-36	On 9-track, 800-bpi tape	400
S90-209-76	On 9-track, 1600-bpi tape	400
S90-209-66	On 10-megabyte disk	450
S90-209-86	On floppy disk	400

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SOFTWARE PRICES

		<u>Purchase Price</u>
Common Assembler Language (CAL) —		
S90-204-99	Documentation Package	25
S90-204-36	On 9-track, 800-bpi tape	150
S90-204-76	On 9-track, 1600-bpi tape	150
S90-204-66	On 10-megabyte byte	450
S90-204-86	On floppy disk	150
S90-205-99	CAL MACRO Documentation Package	25
S90-205-36	CAL MACRO; 9-track, 800-bpi tape	450
S90-205-76	CAL MACRO; 9-track, 1600-bpi tape	450
S90-205-66	CAL MACRO; 10-megabyte disk	750
S90-205-86	CAL MACRO; floppy disk	450
SORT/MERGE —		
S90-407-99	Documentation Package	25
S90-407-36	On 9-track, 800-bpi tape	500
S90-407-76	On 9-track, 1600-bpi tape	500
S90-407-66	On 10-megabyte disk	800
S90-407-86	On floppy disk	500
Loader Storage Limit Support Program —		
S90-402-99	Documentation Package	10
HASP/16 —		
S90-019-99	Documentation Package	25
S90-019-36	On 9-track, 800-bpi tape	1,000
S90-019-76	On 9-track, 1600-bpi tape	1,000
S90-019-66	On 10-megabyte disk	1,300
S90-019-86	On floppy disk	1,000
S90-922	Optional installation (included with S90-905)	1,000