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UNIVAC 1110

MANAGEMENT SUMMARY

The UNIVAC 1110, announced on November 10, 1970, represents a strong UNIVAC bid to update its large-scale computer product line and strengthen its already healthy position in the important upper end of the market. The new system should be an effective performer in a broad range of scientific, business, commercial, and real-time applications.

The 1110 retains virtually all of the processing facilities, peripheral equipment, and software of the widely accepted UNIVAC 1108 system, while providing greatly increased processing power. Complete upward compatibility, at both the source and object code levels, will be maintained with the UNIVAC 1106 and 1108 systems operating under the EXEC 8 Operating System.

First deliveries of the 1110 are scheduled for November 1971, and a prototype system will go into operation in January or February of 1971. System rentals will begin at approximately $60,000 per month and extend upward to over $150,000. ▷

UNIVAC's new large-scale system features multiple processors, two levels of directly addressable storage, and independent I/O controllers and communications processors. The 1110 is upward-compatible with the UNIVAC 1108 and uses most of the 1108 peripheral equipment and software.

CHARACTERISTICS

MANUFACTURER: UNIVAC Division, Sperry Rand Corporation, P.O. Box 500, Blue Bell, Pa. 19422.

MODEL: UNIVAC 1110.

DATA FORMATS

BASIC UNIT: 36-bit word. In main and extended storage, each word location includes two additional parity bits, one for each half-word.

FIXED-POINT OPERANDS: One 36-bit word. Addition and subtraction can also be performed upon variable-length strings, upon 2-word (72-bit) operands, and upon 18-bit half-words and 12-bit third-words; the leftmost bit ▶

Dual-processor UNIVAC 1110 systems such as the one shown here are expected to achieve three to five times the performance of UNIVAC 1108 Unit Processor systems.

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▷ Multiprocessing and two levels of directly addressable storage are the key technical features of the 1110. Every system will include either two or four central processors (called Command/Arithmetic Units, or CAU's) and both high-speed plated-wire and somewhat slower magnetic core storage units. Other significant technical innovations include:

- A four-deep instruction stack in each CAU that permits a high degree of instruction look-ahead and concurrency.

- 112 integrated-circuit control registers in each CAU.

- A powerful instruction set that includes all of the UNIVAC 1108 instructions plus a new group of byte-oriented commercial instructions that facilitate data manipulation, decimal arithmetic, code translation, radix conversion, and editing.

- An extended, 24-bit addressing capability that provides for direct addressing (through base registers) of up to 16 million words of storage.

- Input/Output Access Units (IOAU's) which control all I/O operations independently of the Command/Arithmetic Units. An 1110 system can include one two, or four IOAU's, and each IOAU can accommodate up to 24 I/O channels and an aggregate data rate of up to 24 million characters per second.

- An independently programmed Communications/Symbiont Processor (C/SP) designed to relieve the CAU's of most of the processing functions associated with the control of data communications and low-speed I/O operations. Based on the UNIVAC 9400 processor architecture, the C/SP provides 32K to 131K bytes of 630-nanosecond plated-wire storage and has a full complement of supporting software. In typical transaction-oriented environments, the use of a C/SP should reduce the CAU load by 20 to 25 percent.

- Provisions for complete hardware redundancy through the use of up to four CAU's, four IOAU's, four System Consoles, multiple modules of main and extended storage, and dual-channel peripheral subsystems.

- A System Partitioning Unit (SPU) that permits an 1110 system to be manually separated into two or three logically independent smaller systems.

- Two new, high-performance peripheral devices: the 8440 Disc Subsystem, whose characteristics are similar to (but not compatible with) the IBM 3330, and ▷

▶ holds the sign in each case. Moreover, partial words of 6, 9, 12, or 18 bits can be transferred into and out of the arithmetic and control registers.

FLOATING-POINT OPERANDS: One word, consisting of 27-bit-plus-sign fraction and 8-bit exponent; or two words, consisting of 60-bit-plus-sign fraction and 11-bit exponent.

INSTRUCTIONS: One word, consisting of 6-bit Function Code, 4-bit Partial-Word or Immediate-Operand Designator, 4-bit Control Register Designator, 4-bit Index Register Designator, 1-bit Index Modification Designator, 1-bit Indirect Address Designator, and 16-bit Address Field.

INTERNAL CODE: A 6-bit BCD code, Fieldata, is used for the line printers and console devices; the processors are not code-sensitive and can conveniently manipulate data in any code of 6 to 9 bits.

MAIN STORAGE

STORAGE TYPE: Plated wire.

CAPACITY: Up to 262,144 words, in 32,768-word storage units. (The 1110 Operating System requires the presence of at least 98,304 words of main storage.) Each storage unit contains four simultaneously accessible 8,192-word modules, with odd-even interleaved addressing of each pair of adjacent 8K modules. Each 32K storage unit accommodates up to 8 I/O channels and can service 4 of them simultaneously.

CYCLE TIME: 320 nanoseconds per word for reading and 520 nanoseconds per word for writing (nominal).

CHECKING: Parity bit with each half-word is checked whenever storage is referenced.

STORAGE PROTECTION: The Storage Limits Register, loaded by the Executive System, defines the upper and lower boundaries of both the instruction area and data area that may be referenced by the currently active user program. Any attempt to reference an address beyond these limits causes an interrupt. The setting of a bit in the Processor State Register determines whether the protection is against write operations only or against all reads, writes, and jumps.

EXTENDED STORAGE

STORAGE TYPE: Magnetic core.

CAPACITY: Up to 1,048,576 words, in increments of 65,536 words for the 750-nanosecond storage or 131,072 words for the 1.5-microsecond storage. (The 1110 Operating System requires the presence of at least 262,144 words of extended storage.) One-, two-, or four-way address interleaving is optional. Extended storage is connected to the system by Multiple Access Interface (MAI) units. Each MAI interfaces 131K words of extended storage with up to 4 CAU's and 4 IOAU's.

CYCLE TIME: Choice of 750 nanoseconds or 1.5 microseconds per word.

CHECKING: Parity bit with each half-word is checked whenever storage is referenced.

STORAGE PROTECTION: Same as for main storage, above. ▶

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FULLY SUPPORTED UNIVAC 1110 SYSTEM CONFIGURATIONS

COMPONENTS	CONFIGURATION			
	2 x 1	2 x 2	4 x 2	4 x 4
Command/Arithmetic Units	2	2	4	4
Input/Output Access Units	1	2	2	4
Input/Output Channels	8 to 24	16 to 48	16 to 48	32 to 96
Main Storage (words)	98K to 262K	98K to 262K	131K to 262K	131K to 262K
Extended Storage (words)	262K to 1048K	262K to 1048K	262K to 1048K	262K to 1048K
System Consoles	1 or 2	1 or 2	2	2 to 4
System Partitioning Unit	0 or 1	0 or 1	1	1

▷ the Uniservo 20 Magnetic Tape Unit, which equals the 320KB data transfer rate of the IBM 2420 Model 7.

UNIVAC is currently marketing four "fully supported configurations" of the 1110 hardware; their designations and components are summarized in the accompanying table. Though the present configurations are confined to either two or four CAU's, there are hardware provisions for connecting up to six independent CAU's. It is likely that larger and smaller system configurations, with one and six processors, respectively, will be made available if and when customer demand warrants them.

The instruction stack within each CAU, together with the capability to simultaneously access multiple storage modules, permits overlapping of the five basic stages of instruction execution: instruction acquisition, address generation, operand acquisition, computation, and storage of results. As a result, the total execution time for most 1110 instructions (load, store, fixed-point add, etc.) is a single 300-nanosecond CAU cycle. UNIVAC figures that each CAU in an 1110 system will provide approximately 1.8 times the raw computing power of the 1108 Central Processor.

The plated-wire memory that UNIVAC has been using in its smaller 9000 Series computers since 1966 has finally reached the "big time" as the main storage for the 1110. The nondestructive readout capability of the plated-wire memory yields a cycle time of 320 nanoseconds per word for reading and 520 nanoseconds for writing, and four simultaneous accesses can be made to each 32K storage unit.

The second level of directly addressable storage for the 1110 is provided by conventional magnetic core storage in a choice of 1.5-microsecond or 750-nanosecond cycle ▷

▶ CENTRAL PROCESSORS

CONFIGURATION RULES: Every 1110 system has at least two Command/Arithmetic Units (CAU's) and may be expanded to four CAU's. (Although the hardware includes provisions for up to six CAU's, a maximum of four are being supported at this time.) Each CAU can interface with up to 262K words of main (plated wire) storage, up to 1048K words of extended (core) storage, and up to 2 Input/Output Access Units (IOAU's).

REGISTERS: Each CAU has a General Register Stack consisting of 112 integrated-circuit control registers, each 36 bits long and program-addressable. Register cycle time is 75 nanoseconds. Users' programs can make use of 15 index registers, 16 accumulators (4 of which also serve as index registers), a Repeat Register, a Mask Register, a Real-Time Clock, and a number of unassigned registers that can be used for fast-access temporary storage. Accessible only to the Executive System are duplicate sets of index registers and accumulators, plus a variety of special-purpose registers.

INDEXING: Operand addresses can be modified by the contents of any of the 15 index registers. If desired, the contents of the index register can be automatically incremented by any specified value each time the register is referenced.

INDIRECT ADDRESSING: Possible to any desired number of levels, with full indexing capabilities at each level.

INSTRUCTION REPERTOIRE: Consists of 199 instructions, all one word in length. Most instructions specify the address of one operand in core storage and one of the 16 accumulators. Complete binary arithmetic facilities are provided for single-precision fixed-point and both single and double-precision floating-point operands. Addition and subtraction can also be performed on variable-length byte strings, on double-precision fixed-point operands, and on 18-bit half-words and 12-bit third-words. Also included are extensive facilities for testing, shifting, searching, logical, byte manipulation, and radix conversion operations. ▶

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▷ times. The 1110 Operating System requires the presence of at least 262K words of this extended storage, and a maximum of 1048K words can be used. Two-way or four-way interleaving is offered as an option.

UNIVAC 1110 systems can include most of the peripheral equipment that is currently available for the 1106 and 1108. The only exceptions are the older UNIVAC 1107 peripherals (such as the FH-880 Drum and the Uniservo II A, III A, III C, and IV C Magnetic Tape Units), which will not be supported for the 1110. UNIVAC now offers an exceptionally broad range of mass storage devices, including fixed-head drums, moving-head drums (Fastrand), and disc pack drives. In addition, the whole range of UNIVAC 9000 Series peripheral devices can be connected to an 1110 system via either the C/SP or an on-line UNIVAC 9200 or 9300 Processor.

The new 8440 Disc Drive stores up to 114 million 6-bit characters of data on each 11-disc pack. Though its capacity is somewhat larger than that of the IBM 3330, its access time and data transfer rate are a little slower. Unlike IBM, UNIVAC offers dual-channel controllers that permit simultaneous read/write operations on two of the drives in an 8440 subsystem. UNIVAC says its decision not to make the 8440 disc packs and recording format compatible with the IBM 3330 enabled it to save many months of engineering lead time. Deliveries of the 8440 are scheduled to begin in the second quarter of 1972.

Software support for the 1110 will be provided by the UNIVAC 1110 Operating System, a modular extension of the EXEC 8 Operating System that is now in use on the 1106 and 1108. EXEC 8 furnishes comprehensive supervisory and control facilities for three distinct modes of multiprogrammed operation: batch, demand (or time-sharing), and real-time (or communications). Related facilities include processors for the COBOL, FORTRAN V, Conversational FORTRAN, ALGOL, APL, JOVIAL, BASIC, and Assembly languages, plus a variety of utility routines and application packages.

Though EXEC 8's capabilities are highly impressive, its performance to date has been somewhat disappointing in terms of large storage requirements and high operational overheads. Recently released versions of EXEC 8, however, show definite improvements in these areas. A key factor in determining the success of the UNIVAC 1110 will be the degree of effectiveness with which the extended version of EXEC 8 can allocate and control the multiple processors, dual-level storage, and other elements of this architecturally complex system.

For current users of the UNIVAC 1108, the 1110 shapes up as a highly suitable upgrade system. It offers greatly increased processing power with minimal conversion difficulty. Moreover, companies that have purchased 1108 ▷

▶ INSTRUCTION TIMES: The following table lists representative instruction times for each CAU. All times are in microseconds and are preliminary estimates, based on no conflicts in the processors or storage units, no IOAU activity, and instructions and data located in different 8K segments of main storage. Note that every 1110 system includes either two or four CAU's.

Fixed-point add/subtract (36 bits)	0.30
Fixed-point multiply (36 bits)	1.55
Fixed-point divide (36 bits)	6.70
Floating-point add/subtract (single precision)	1.05
Floating-point multiply (single precision)	1.70
Floating-point divide (single precision)	5.80
Floating-point add/subtract (double precision)	1.00
Floating-point multiply (double precision)	2.40
Floating-point divide (double precision)	11.95
Load/store (36, 18, 12, 9, or 6 bits)	0.30
Load/store (72 bits)	0.60
Byte move (per byte)	1.15
Byte compare (per byte)	2.25
Byte translate (per byte)	2.00
Byte add/subtract (per byte)	1.95

PROCESSOR MODES: When a CAU is operating in Guard Mode, as denoted by the setting of a bit in the Processor State Register, no accesses to the Executive control registers are permitted, and the Storage Limits Register defines the main storage areas that can be accessed. When the Guard Mode bit is turned off, all registers and storage locations can be freely accessed. The Guard Mode is normally enabled for user programs and disabled for Executive functions.

INTERRUPTS: A program interrupt facility causes storage of the Processor State Register's current contents and a transfer of control to the Executive System whenever one of the following conditions occurs: completion of an I/O operation, abnormal condition in an I/O subsystem, processor or storage fault, program error, or program-requested interrupt. Each IOAU contains a 2-bit pointer register that determines which CAU receives I/O interrupt signals. If desired, each I/O interrupt can be directed to the CAU that initiated the I/O operation on the channel involved.

CONSOLE: The System Console is a free-standing I/O subsystem used to monitor and direct an 1110 system's functions. It consists of a Uniscope 100 CRT display, a typewriter-style keyboard and control panel, and a Pagewriter printer for hard-copy output. The CRT displays 16 lines of 64 characters each, and the printer can print 80-character lines at 25 characters per second. The System Console also includes a fault indicator, which indicates fault conditions in major system components, and a real-time maintenance communication system (RTMCS), which permits diagnostic maintenance operations to be performed from a remote location via a telephone line.

SYSTEM PARTITIONING UNIT (SPU): Permits manual separation of an 1110 system into two or three logically independent smaller systems, permits individual units to be taken off-line for maintenance, and initiates automatic recovery procedures when failures occur. The SPU is an optional component in two-processor 1110 systems and is ▶

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The 1110 System Console, used to monitor and direct the system's functions, consists of a Uniscope 100 CRT display, keyboard, and Pagewriter printer.

▷ systems will be able to salvage most of their investment by reusing the 1108 peripheral equipment and using the 750-nanosecond 1108 core storage modules as extended storage for the 1110.

For companies which are not currently using UNIVAC equipment, the 1110 still has a lot to offer. It combines the best features of the highly respected UNIVAC 1108 with a number of impressive hardware innovations.

As compared with the IBM System/370 Model 165, a dual-processor 1110 system appears to offer a little more computing power at a somewhat lower price. In business data processing and real-time applications, where the Model 165's buffer memory is not particularly effective and the 1110's substantially higher I/O capacity can be used advantageously, the 1110 should exhibit a significant price/performance edge. UNIVAC's fully bundled support policy will result in additional savings for 1110 users.

Thus, the 1110 seems to have all the necessary ingredients to maintain and strengthen UNIVAC's position in the large-scale computer market. The critical question is whether the supporting software will permit effective utilization of the system's impressive hardware capabilities. □

▶ required in four-processor systems. When all optional features are included, the SPU can interface with 4 CAU's, 4 IOAU's, 262K words of main storage, 1048K words of extended storage, and 48 multi-access peripheral subsystems.

INPUT/OUTPUT CONTROL

I/O CHANNELS: Each Input/Output Access Unit (IOAU) contains 8, 16, or 24 channels.

CONFIGURATION RULES: A two-processor 1110 system can include one or two IOAU's (up to 48 channels), and a four-processor system can include two or four IOAU's (up to 96 channels). The IOAU's control all transfers of data between peripheral devices and main and extended storage. Each IOAU can interface with up to 2 CAU's, up to 262K words of main storage, and up to 1048K words of extended storage.

SIMULTANEOUS OPERATIONS: One high-speed input or output operation on each I/O channel can occur simultaneously with computation in each CAU. Moreover, the Externally Specified Index (ESI) mode permits multiple remote communications devices to transmit data to and from main storage in multiplexed fashion over a single I/O channel. All installed CAU's and IOAU's can operate simultaneously and independently, with interference occurring only when two or more of these units simultaneously attempt to access the same 8K storage module.

MAXIMUM I/O DATA RATES: Each IOAU can accommodate an aggregate data transfer rate of up to 24 million characters per second.

MASS STORAGE

FH-432 MAGNETIC DRUM: Provides fast random access to fairly small quantities of data. Stores 262,144 words (1,572,864 characters) in 384 data tracks, each served by a fixed read/write head. Data is read and written in 3 tracks in parallel, and each 3-track group holds 2,048 words. Average access time is 4.3 milliseconds. Data transfer rate ranges from 1,440,000 down to 90,000 characters per second, depending upon the degree of interlacing employed. An FH-432 subsystem consists of a control ▶

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unit and one to eight drums. FH-432 and FH-1782 drums can be intermixed in the same subsystem, and dual-channel access to a subsystem is possible through the use of two control units and appropriate special features.

FH-1782 MAGNETIC DRUM: Provides eight times the storage capacity of the FH-432 Drum with an access time four times as long. Stores 2,097,152 words (12,582,912 characters) in 1536 data tracks, each served by a fixed read/write head. Average access time is 17 milliseconds. Data transfer rate (as in the FH-432) ranges from 1,440,000 down to 90,000 characters per second, depending upon the degree of interlacing employed. An FH-1782 subsystem consists of a control unit and one to eight drums. FH-432 and FH-1782 drums can be intermixed in the same subsystem, and dual-channel access to a subsystem is possible through the use of two control units and appropriate special features.

FASTRAND MASS STORAGE: Provides moderately fast access to large quantities of data stored on magnetic drums. Each Fastrand unit is served by 64 read/write heads. The heads are mounted on a common positioning unit that moves laterally, allowing each head to serve 192 tracks. Average head positioning time is 57 milliseconds, and average rotational delay is 35 milliseconds. Data is stored in 28-word sectors. An off-line search capability enables the Fastrand unit to search for a specific data record and notify the central processor when it is found.

Two models of Fastrand Mass Storage are currently being marketed. Fastrand II stores 22,020,096 words (132 million characters) in each drum unit, while Fastrand III, which has a 50 percent higher recording density, stores 33,030,144 words (198 million characters) in each unit. Data transfer rate is 153,600 characters per second for Fastrand II and 230,400 characters per second for Fastrand III.

An optional feature called Fastband adds 24 fixed read/write heads, each serving one track, with an average access time of 35 milliseconds. The Fastband option increases the storage capacity by 43,008 words per Fastrand II unit or 64,512 words per Fastrand III unit.

A Fastrand II or III subsystem consists of a single- or dual-channel control unit and from one to eight drums. The dual-channel control unit permits simultaneous operations on any two drums in the subsystem.

8414 DISC DRIVE: Provides large-capacity random-access storage in interchangeable 11-disk packs which are physically compatible with the IBM 2316 Disk Packs used in the IBM 2314 Direct Access Storage Facility. Each pack stores up to 29.17 million bytes of data. Up to 145,880 bytes (20 tracks) can be read or written at each position of the comb-type access mechanism. Average head movement time is 60 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 312,000 bytes/second. Record lengths are variable, with each track capable of holding up to 7,294 eight-bit bytes. The File Scan and Record Overflow features are standard.

When data is stored on an 8414 in a simulated Fastrand format, each track holds 12 sectors of 112 words each. In this format, each 8414 pack stores 5.4 million 36-bit words, and the data transfer rate is 69,444 words/second.

An 8414 subsystem consists of a control unit and two to eight disc drives; the Multi-Subsystem Adapter (MSA) and

Function Buffer Expansion Feature are prerequisites. A dual-access subsystem can be configured by adding a second control unit and the MSA Expansion feature.

8440 DISC SUBSYSTEM: Provides fairly rapid access to extremely large quantities of data stored in interchangeable 11-disk packs. When data is stored in a simulated Fastrand format, each pack holds up to 19 million words (or 114 million 6-bit characters) of data. Each of the 19 data recording surfaces has 406 addressable tracks, and each track holds 22 sectors of 112 words each. Up to 46,816 words (19 tracks) can be read or written at each position of the comb-type access mechanism. Average head movement time is 35 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 138,888 words (or 833,328 6-bit characters) per second.

An 8440 subsystem consists of a control unit and from one to eight disc drives. Each drive is housed in a separate cabinet. Optional dual controllers permit concurrent read/read, read/write, or write/write operations on two of the drives in a subsystem. Initial deliveries of the 8440 are scheduled for the second quarter of 1972. The disc packs used with the 8440 are not compatible with those used with the IBM 3330, IBM 2314, or UNIVAC 8414 drives; UNIVAC believes its use of nickel-cobalt plating on the recording surfaces of the 8440 pack will lead to higher reliability than the oxide coatings used on most other packs.

INPUT/OUTPUT UNITS

UNISERVO VIII C MAGNETIC TAPE UNIT: Reads and records data on standard 1/2-inch tape in IBM-compatible formats. Available in both 9-track and 7-track versions. Tape speed is 120 inches per second, and backward reading is a standard feature. The 9-track version has a recording density of 800 bpi, while the 7-track version can operate at 200, 556, or 800 bpi. The 9-track model transfers 128,000 six-bit characters (or 96,000 bytes) per second, while the 7-track model transfers a maximum of 96,000 characters per second (at 800 bpi). A Uniservo VIII C subsystem consists of up to 16 tape units connected to a single- or dual-channel control unit.

UNISERVO 12 MAGNETIC TAPE UNIT: A medium-speed tape drive that reads and records data on standard 1/2-inch tape in IBM-compatible formats. Available in both 9-track and 7-track versions. Tape speed is 42.7 inches per second, forward or backward. The standard 9-track version has a recording density of 1600 bpi (in phase-encoded mode) and a data rate of 68,320 bytes (or 91,000 six-bit characters) per second; the optional Dual Density feature permits operation at 800 bpi (in NRZI mode) at a data rate of 34,160 bytes per second—the same speed as the Uniservo VI C. The 7-track version can operate at 200, 556, or 800 bpi, with corresponding data rates of 8,540, 23,740, or 34,160 characters per second. A Uniservo 12 subsystem consists of up to 16 tape units (4 "master" units and 12 "slave" units) connected to a single-channel control unit; the Multi-Subsystem Adapter is a prerequisite. Uniservo 12 and Uniservo 16 tape units can be intermixed in the same subsystem, provided they are not dual-access units.

UNISERVO 16 MAGNETIC TAPE UNIT: A high-speed tape drive that reads and records data on standard 1/2-inch tape in IBM-compatible formats. Available in both 9-track and 7-track versions. Tape speed is 120 inches per second, forward or backward. The standard ▶

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► 9-track version has a recording density of 1600 bpi (in phase-encoded mode) and a data rate of 192,000 bytes (or 256,000 six-bit characters) per second; the optional Dual Density feature permits operation at 800 bpi (in NRZI mode) at a data rate of 96,000 bytes per second. The 7-track version operates at 200, 556, or 800 bpi, with corresponding data rates of 24,000, 66,720, or 96,000 characters per second. A Uniservo 16 subsystem consists of up to 16 tape units connected to a single- or dual-channel control unit; the Multi-Subsystem Adapter is a prerequisite. Uniservo 16 and Uniservo 12 tape units can be intermixed in the same subsystem, provided they are not dual-access units.

UNISERVO 20 MAGNETIC TAPE UNIT: A high-performance tape drive that uses standard 1/2-inch tape and matches the performance of the IBM 2420 Model 7. Data is recorded in the 9-track mode at 1600 bpi. Tape speed is 200 inches per second, forward or backward, yielding a data transfer rate of 320,000 bytes (or 426,667 six-bit characters) per second. Operational conveniences include a power window, automatic tape threading, and wrap-around tape cartridge loading. A Uniservo 20 subsystem consists of 1 to 16 tape units connected to a single- or dual-channel control unit. Uniservo 12 and 16 tape units can also be connected to the Uniservo 20 control unit. The Multi-Subsystem Adapter (MSA), which is a prerequisite for the Uniservo 12 and 16 subsystems, is furnished as an integral part of the Uniservo 20 control unit.

CARD READER: Reads 80-column cards serially by column at 900 cpm, using photodiodes with redundant read checking. Input hopper holds 3000 cards and main stacker holds 2400 cards. Error cards are routed into a 100-card reject stacker. Reads data punched in Fieldata code, row binary, or column binary. Connects to a Card Control, which uses one I/O channel and also accommodates a 300-cpm Card Punch.

CARD PUNCH: Punches 80-column cards on a row-by-row basis at 300 cpm, with read-after-punch checking. Has a 1000-card input hopper and two 850-card stackers. Can punch data in Fieldata code, row binary, or column binary. Connects to a Card Control, which uses one I/O channel and also accommodates a 900-cpm Card Reader.

HIGH-SPEED PRINTER: Prints at 1200 lpm when the full 63-character set is used and at 1600 lpm when using any 43 contiguous characters. Uses a conventional rotating-drum printing mechanism. Has 132 print positions. Skipping speed is 33 inches per second when printing at 6 lines per inch; an alternate line spacing of 8 lines per inch can be manually selected. Handles continuous forms from 4 to 22 inches in width. Connects to a Printer Control, which occupies one I/O channel and can be expanded to control a second printer.

UNIVAC 9000 SERIES SUBSYSTEMS: A UNIVAC 9200, 9200 II, 9300, or 9300 II Computer System can be connected directly to an 1100 Series system by means of an Inter-Computer Control Unit (ICCU). The ICCU permits direct communication in the 36-bit word format. The 9000 Series system must include at least 8K bytes of storage, a multiplexer I/O channel, integrated printer, and card reader. Other 9000 Series peripheral units and features can also be used, but software support via the ICCU is limited to the card reader, punch, and printer. See Report 70C-877-01 for details about the 9000 Series Computer Systems.

The Type 0768-02 Printer is a recently announced 9000 Series peripheral unit that may be of interest because it provides upper/lower case printing, a capability previously unavailable in the UNIVAC product line. Rated printing speeds are 840 lpm when the full 94-character set is used, 1000 lpm for any contiguous 87-character subset, and 2000 lpm for a 14-character numeric subset. There are 132 print positions, and skipping speed is 33 inches per second. A "Load Code" command enables the 0768-02 to use ASCII, EBCDIC, or any desired 7- or 8-bit code.

The Type 0716 Card Reader is a high-speed reader that connects to the Multiplexer Channel of a 9000 Series computer. It can read 80 column cards in EBCDIC, ASCII, Compressed Code, or card image mode at 1000 cpm. It has a 2400-card input hopper and two 2000-card stackers. Optional features permit reading of 51- or 66-column cards.

COMMUNICATION CONTROLS

1110 COMMUNICATIONS SUBSYSTEM: Enables an 1110 system to transmit and receive data in multiplexed fashion over up to 32 communications lines at line speeds of up to 50,000 bits per second. The subsystem consists of a Communications Terminal Module Controller (CTMC), which connects to any channel of an Input/Output Access Unit, and up to 16 Communications Terminal Modules (CTM's). Each serial CTM accommodates two full-duplex or two half-duplex lines. Transmission is in bit-serial mode, using codes of 5, 6, 7, or 8 levels. The low-speed, medium-speed, and high-speed CTM's can handle speeds of up to 300, 1800, and 50,000 bits per second, respectively. In addition to the bit-serial CTM's, there are parallel input and output modules, which handle up to 75 eight-bit characters per second on a single line, and a single-line automatic dialing module.

COMMUNICATIONS/SYMBIONT PROCESSOR (C/SP): An independently programmed computer designed to relieve the Command/Arithmetic Units of the processing functions associated with the control of data communications and card and printer I/O operations. The C/SP's internal architecture is quite similar to that of the UNIVAC 9400 Processor. It offers 32K, 49K, 65K, 98K, or 131K bytes of plated-wire storage with a cycle time of 630 nanoseconds per 2-byte access. A set of 52 two-byte and four-byte instructions includes binary arithmetic on 16-bit and 32-bit operands; no decimal arithmetic facilities are provided. There are sixteen 32-bit general registers.

The basic C/SP configuration includes a processor with 32K to 131K bytes of storage, 1100 Series Adapter Channel, Special Device Channel, Maintenance Panel, Interval Timer, Power Failure Interrupt Feature, and Storage Protection Feature. Optional features include a Multiplexer Channel and one or two General-Purpose Communications Channels.

The 1100 Series Adapter Channel provides an interface for direct connection of the C/SP to an I/O channel of an 1100 Series computer; data can be transferred at rates in excess of 300,000 36-bit words per second. The Special Device Channel is used mainly for local program loading and maintenance of the C/SP by means of an 80-cpm serial card reader. The optional Multiplexer Channel permits attachment of all of the currently available UNIVAC 9000 Series peripheral devices, as described in Reports 70C-877-01 and 70C-877-02. ►

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▶ Each of the two optional General-Purpose Communications Channels (GPCC's) permits connection of up to 32 full-duplex or 64 half-duplex communications lines to the C/SP. The GPCC multiplexes the data to and from the various lines, recognizes special characters and character sequences, checks character parity, and performs other essential coordination functions. A Communications Line Terminal (CLT) forms the interface between the GPCC and each line. Various CLT's are available to handle a wide range of communications facilities and transmission speeds. The number and types of CLT's must be selected so that the total data rate on each GPCC will not exceed 50,000 bytes per second. Software considerations will further restrict the total communications data rate of each C/SP to approximately 20,000 bytes per second.

SOFTWARE

GENERAL: Software support for the 1110 will be provided by the UNIVAC 1110 Operating System. This is a modular extension of the EXEC 8 Operating System which is currently in use on the UNIVAC 1106 and 1108 computers, and UNIVAC promises that full compatibility with EXEC 8 will be maintained. Appropriate modifications and extensions to EXEC 8 will be made to support the architectural improvements in the 1110 hardware.

Multiprocessing will be the normal mode of operation under the 1110 Operating System, and concurrent batch, demand (multi-access), and real-time processing will be supported. Up to 26 levels of scheduling priorities can be used, and the number of programs that can run concurrently will be limited only by the availability of hardware resources.

All of the EXEC 8 language processors, utility routines, and application packages will also be usable on the 1110. For a detailed description of EXEC 8 and these related software facilities, please refer to Report 70C-877-11.

C/SP SOFTWARE: Software support for the independently programmed Communications/Symbiont Processor consists of a group of resident programs, which run on the C/SP itself, and a second group of programs that run on the host 1110 under control of the 1110 Operating System.

The C/SP-resident programs include an operating system, diagnostic routines, and an intercomputer adapter handler. The C/SP Operating System, in turn, consists of a Terminal Management Supervisor, Message Control Program, Terminal Management Control Routine, and Communication Control Routines. These routines control program switching, I/O queuing, interrupt handling, call initiation, message routing, message translation and editing, initiation of polling, dynamic buffering, and a variety of other standard communications control functions. UNIVAC will supply standard Communication Control Routines for the following remote devices: Uniscope 100 Display Terminal; DCT 500, DCT 1000, and DCT 2000 Data Communications Terminals; UNIVAC 1004 and 9000 Series Computers; and Binary Synchronous Communication (BSC) devices.

C/SP programs that run on the host 1110 system include an Assembler, Element Collector, Simulator, and Symbionts. The C/SP Assembler is a two-pass assembler that translates C/SP programs from symbolic assembly language into relative binary elements. The C/SP Element Collector combines a group of these elements into a relocatable object program that can be executed by the C/SP. The C/SP Simulator accepts C/SP object code, simulates its execution, and provides diagnostic printouts to aid in program debugging. The C/SP Symbionts accommodate the specific capabilities of the C/SP and handle communications between the C/SP and the 1110 Operating System.

PRICING

EQUIPMENT: The following configurations illustrate "small" and "medium" UNIVAC 1110 systems, each with two Command/Arithmetic Units and with one and two Input/Output Access Units, respectively. All necessary control units and adapters are included in the indicated prices, and the quoted rental prices include equipment maintenance.

2 X 1 SYSTEM: Consists of two CAU's, one IOAU with 8 channels, 98K words of main storage, 262K words of extended storage, System Console, Communications/Symbiont Processor (with 65K bytes of storage, 1000-cpm card reader, and 1000-lpm printer), two FH-432 Drums (3.1 million characters), two 8440 Disc Drives (228 million characters), and six Uniservo 16 Magnetic Tape Units (192KB). Monthly rental price is approximately $66,050.

2 X 2 SYSTEM: Consists of two CAU's, two IOAU's with 16 channels each, 131K words of main storage, 393K words of extended storage, System Console, Communications/Symbiont Processor (with 65K bytes of storage, 1000-cpm card reader, and two 1000-lpm printers), six FH-432 Drums (9.4 million characters), four 8440 Disc Drives (456 million characters), and eight Uniservo 20 Magnetic Tape Units (320KB). Monthly rental price is approximately $90,900.

SOFTWARE AND SUPPORT: UNIVAC has not "unbundled" to date, so the equipment prices listed above include all of the UNIVAC software described in this report and all normal educational courses and professional assistance. (A Basic Equipment Plan, offered only to certain self-sufficient users, provides the equipment and standard software, without UNIVAC support services, at a discount of approximately 13% from the list prices shown here.)

CONTRACT TERMS: The standard UNIVAC use and service agreements allow unlimited use of the equipment (exclusive of the time required for remedial and preventive maintenance). There are no extra-use charges. The basic maintenance charge covers maintenance of the equipment for nine consecutive hours a day, Monday through Friday. Extended periods of maintenance are available at extra cost. ■

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*
PROCESSORS AND I/O CONTROL				
3023-99	1110 Processor (2 CAU's)	692,520	2,655	15,920
3023-98	CAU Expansion (3rd & 4th CAU's)	547,885	1,330	12,595
3025-00	Input/Output Access Unit (8 channels)	125,715	670	2,890
F1387-00	I/O Channel Expansion (Channels 9-16)	16,095	40	370
F1387-01	I/O Channel Expansion (Channels 17-24)	16,095	40	370
4013-99	System Console	63,730	270	1,465
0769-10	Incremental Printer	2,395	20	55
2516-00	System Partitioning Unit (SPU)	48,505	125	1,115
F1448-00	CAU Interface Expansion	5,005	10	115
F1449-00/01	IOAU Interface Expansion	5,005	10	115
F1450-00/01	MSU Interface Expansion	3,265	10	75
F1451-00/03	MAI Interface Expansion	2,830	10	65
F1441-00/04	MAS Interface Expansion	2,395	5	55
F1441-05/06	Peripheral Interface	2,395	5	55
0955-99	Shared Peripheral Interface (permits 2 IOAU's to share a peripheral subsystem)	19,575	25	450
0955-98	Shared Peripheral Interface (shares a cabinet with Type 0955-99 SPI)	17,400	20	400
F0789-99	SPI Expansion (adds a 3rd interface)	3,480	5	80
F0789-98	SPI Expansion (adds a 4th interface)	2,395	5	55
F1095-99	1110/9000 Inter-Computer Control Unit (for on-line connection of a UNIVAC 9000 Series computer)	8,920	45	205
MAIN STORAGE (PLATED-WIRE)				
7015-00	Main Storage Unit; 32,768 words	300,805	425	6,915
F1331-00	Storage Expansion; additional 32,768 words	256,435	290	5,895
F1330-00	MMA Expansion; provides 4 additional access paths to Main Storage Unit	15,225	20	350
EXTENDED STORAGE (CORE)				
7013-81	Unitized Storage; 131,072 words, 1.5-microsecond cycle time	135,120	315	2,815
0963-00	Multiple Access Interface	43,065	120	990
F1394-00	MAI Expansion	19,575	75	450
F1393-00	MAI Interface Expansion	11,530	20	265
F1393-01	MAI Interface Expansion	11,530	20	265
F1397-00	1108 Storage Interface (for 750-nanosecond UNIVAC 11108 core storage units)	8,920	15	205
F1384-99	MMA Expansion	3,265	10	75
MASS STORAGE**				
5033-99	8440 Disc Control	86,400	450	1,800
8440-00	8440 Disc Drive	27,840	145	580
F1324-02	Shared Peripheral Interface	6,000	25	125
F1325-00	ASCII Translator	1,920	10	40
F1325-01	EBCDIC Translator	1,920	10	40
F1482-00	Dual Access (permits simultaneous 2-channel access when used with two 5033-99 Controls)	2,160	5	45
F1220-00	8440 Disc Pack	1,100	NA	NA

* Rental prices do not include equipment maintenance.
** Please refer to the UNIVAC 1106 & 1108 Equipment Prices (Report 70C-877-11) for prices of other mass storage, input/output, and communications equipment that can be used in a UNIVAC 1110 system.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*
INPUT/OUTPUT UNITS**				
5034-99	Uniservo 20 Control Unit	51,360	120	1,070
F0823-98	7-Track Capability	5,280	15	110
F0826-99	9-Track NRZI	6,240	20	130
F1028-98	9-Track Addition	5,280	15	110
F1028-97	7-Track Addition	4,320	10	90
F1324-02	Shared Peripheral Interface	6,000	25	125
F1325-00	ASCII Translator	1,920	10	40
F1325-01	EBCDIC Translator	1,920	10	40
0864-00	Uniservo 20 Magnetic Tape Unit	41,280	140	860
F1510-00	Dual Access Feature	2,175	10	50
0716-02	Card Reader and Control; 1000 cpm (connects to C/SP or on-line 9000 Series computer)	13,680	90	285
0768-02	Printer and Control; 840/1000 lpm (connects to C/SP or on-line 9000 Series computer)	46,545	355	1,070
COMMUNICATION/SYMBIONT SUBSYSTEM**				
3021-99	Communication/Symbiont Processor	21,120	60	440
F1276-99	1100 Channel Adapter	5,280	20	110
F1418-00	Special Device Channel	1,440	5	30
F1274-00	Multiplexer Channel	6,000	20	125
7010-87	C/SP Storage; 32,768 bytes	40,800	125	850
7010-86	C/SP Storage; 49,152 bytes	61,200	190	1,275
7010-85	C/SP Storage; 65,536 bytes	81,600	245	1,700
7010-84	C/SP Storage; 98,304 bytes	122,400	345	2,550
7010-83	C/SP Storage; 131,072 bytes	163,200	445	3,400
8542-00	General-Purpose Communications Channel (for C/SP)	11,040	30	230
F1367-00	Multiplexer Expansion	960	5	20
F1286-00	CLT Expansion Module	3,360	15	70
F1287-00	Active Line Indicators	480	—	10
F1287-01	Line Indicator Expansion	480	—	10
F1365-99	ATA	720	5	15
F1290-00	Asynchronous CLT; EIA RS232B	335	5	7
F1290-01	Asynchronous CLT; Mil. Std. 188B	335	5	7
F1290-02	Asynchronous CLT; CCITT	335	5	7
F1290-03	Asynchronous CLT; Telegraph I	335	5	7
F1290-04	Asynchronous CLT; Telgraph II	335	5	7
F1291-00	Synchronous CLT; EIA RS232B	1,680	10	35
F1291-01	Synchronous CLT; Mil. Std. 188B	1,680	10	35
F1291-02	Synchronous CLT; CCITT	1,680	10	35
F1291-04	Synchronous CLT; Telpak	2,160	10	45
F1292-00	Dialing Adapter, Single	720	5	15
F1292-01	Dialing Adapter, Double	1,440	5	30

* Rental prices do not include equipment maintenance.
** Please refer to the UNIVAC 1106 & 1108 Equipment Prices (Report 70C-877-11) for prices of other mass storage, input/output, and communications equipment that can be used in a UNIVAC 1110 system.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*
PROCESSORS AND I/O CONTROL				
3023-99	1110 Processor (2 CAU's)	692,520	2,840	16,716
3023-98	CAU Expansion (3rd & 4th CAU's)	547,885	1,423	13,224
3025-00	Input/Output Access Unit (8 channels)	125,715	716	3,034
F1387-00	I/O Channel Expansion (Channels 9-16)	16,095	42	388
F1387-01	I/O Channel Expansion (Channels 17-24)	16,095	42	388
4013-99	System Console	63,730	288	1,538
0769-10	Incremental Printer	10,500	50	240
2516-00	System Partitioning Unit (SPU)	48,505	133	1,170
F1448-00	CAU Interface Expansion	5,005	10	120
F1449-00/01	IOAU Interface Expansion	5,005	10	120
F1450-00/01	MSU Interface Expansion	3,265	10	78
F1451-00/03	MAI Interface Expansion	2,830	10	68
F1441-00/04	MAS Interface Expansion	2,395	5	57
F1441-05/06	Peripheral Interface	2,395	5	57
0955-99	Shared Peripheral Interface (permits 2 IOAU's to share a peripheral subsystem)	19,575	26	472
0955-98	Shared Peripheral Interface (shares a cabinet with Type 0955-99 SPI)	17,400	21	420
F0789-99	SPI Expansion (adds a 3rd interface)	3,480	5	84
F0789-98	SPI Expansion (adds a 4th interface)	2,395	5	57
F1095-99	1110/9000 Inter-Computer Control Unit (for on-line connection of a UNIVAC 9000 Series computer)	8,920	48	215
MAIN STORAGE (PLATED-WIRE)				
7015-00	Main Storage Unit; 32,768 words	300,805	425	6,915
F1331-00	Storage Expansion; additional 32,768 words	256,435	290	5,895
F1330-00	MMA Expansion; provides 4 additional access paths to Main Storage Unit	7,615	10	175
EXTENDED STORAGE (CORE)				
7013-81	Unitized Storage; 131,072 words, 1.5-microsecond cycle time	135,120	337	2,955
0963-00	Multiple Access Interface	43,065	128	1,039
F1394-00	MAI Expansion	19,575	80	472
F1393-00	MAI Interface Expansion	11,530	21	278
F1393-01	MAI Interface Expansion	11,530	21	278
F1397-00	1108 Storage Interface (for 750-nanosecond UNIVAC 1108 core storage units)	8,920	16	215
F1384-99	MMA Expansion	3,265	10	78
MASS STORAGE **				
5033-99	8440 Disc Control	86,400	450	1,800
8440-00	8440 Disc Drive	27,840	145	609
F1324-02	Shared Peripheral Interface	6,000	25	125
F1325-00	ASCII Translator	1,920	10	40
F1325-01	EBCDIC Translator	1,920	10	40
F1482-00	Dual Access (permits simultaneous 2-channel access when used with two 5033-99 Controls)	2,160	5	45
F1220-00	8440 Disc Pack	1,100	NA	NA

  * Rental prices do not include equipment maintenance.
 ** Please refer to the UNIVAC 1106 & 1108 Equipment Prices (Report 70C-877-11) for prices of other mass storage, input/output, and communications equipment that can be used in a UNIVAC 1110 system.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*
INPUT/OUTPUT UNITS**				
5034-99	Uniservo 20 Control Unit	51,360	120	1,070
F0823-98	7-Track Capability	5,280	15	110
F0826-99	9-Track NRZI	6,240	20	130
F1028-98	9-Track Addition	5,280	15	110
F1028-97	7-Track Addition	4,320	10	90
F1324-02	Shared Peripheral Interface	6,000	25	125
F1325-00	ASCII Translator	1,920	10	40
F1325-01	EBCDIC Translator	1,920	10	40
0864-00	Uniservo 20 Magnetic Tape Unit	38,400	140	800
F1510-00	Dual Access Feature	2,175	10	50
0716-02	Card Reader and Control; 1000 cpm (connects to C/SP or on-line 9000 Series computer)	13,680	90	299
0768-02	Printer and Control; 840/1000 lpm (connects to C/SP or on-line 9000 Series computer)	46,545	379	1,123
COMMUNICATION/SYMBIONT SUBSYSTEM**				
3021-99	Communication/Symbiont Processor	21,120	60	440
F1276-99	1100 Channel Adapter	5,280	20	110
F1418-00	Special Device Channel	1,440	5	30
F1274-00	Multiplexer Channel	6,000	20	125
7010-87	C/SP Storage; 32,768 bytes	40,800	125	850
7010-86	C/SP Storage; 49,152 bytes	61,200	190	1,275
7010-85	C/SP Storage; 65,536 bytes	81,600	245	1,700
7010-84	C/SP Storage; 98,304 bytes	122,400	345	2,550
7010-83	C/SP Storage; 131,072 bytes	163,200	445	3,400
8542-00	General-Purpose Communications Channel (for C/SP)	11,040	30	230
F1367-00	Multiplexer Expansion	960	5	20
F1286-00	CLT Expansion Module	3,360	15	70
F1287-00	Active Line Indicators	480	—	10
F1287-01	Line Indicator Expansion	480	—	10
F1365-99	ATA	720	5	15
F1290-00	Asynchronous CLT; EIA RS232B	335	5	7
F1290-01	Asynchronous CLT; Mil. Std. 188B	335	5	7
F1290-02	Asynchronous CLT; CCITT	335	5	7
F1290-03	Asynchronous CLT; Telegraph I	335	5	7
F1290-04	Asynchronous CLT; Telgraph II	335	5	7
F1291-00	Synchronous CLT; EIA RS232B	1,680	10	35
F1291-01	Synchronous CLT; Mil. Std. 188B	1,680	10	35
F1291-02	Synchronous CLT; CCITT	1,680	10	35
F1291-04	Synchronous CLT; Telpak	2,160	10	45
F1292-00	Dialing Adapter, Single	720	5	15
F1292-01	Dialing Adapter, Double	1,440	5	30

  * Rental prices do not include equipment maintenance.
** Please refer to the UNIVAC 1106 & 1108 Equipment Prices (Report 70C-877-11) for prices of other mass storage, input/output, and communications equipment that can be used in a UNIVAC 1110 system.

This price list reflects the UNIVAC price changes that became effective on February 1, 1972. For the 1110 mainframe (exclusive of main storage) and for certain peripheral devices, monthly rental charges were increased by 5% and maintenance charges by 7%.

In addition to the basic 1-year agreement, UNIVAC offers extended-term 5-year leases for the 1110 at significantly lower monthly rates. Under the 5-year "level-payment" plan, the monthly equipment charge is 80% of the indicated 1-year rental rate. Under the 5-year "reducing-payment" plan, the monthly equipment charge is 90% of the 1-year rental rate during the first year, 85% the second year, 80% the third year, 75% the fourth year, and 70% the fifth year.

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PRICE CHANGE ANNOUNCEMENT

UNIVAC announced increases in the monthly rentals, purchase prices, and maintenance charges for selected mainframes and peripheral units on August 5, 1971. Monthly maintenance charges went up by 7 percent on nearly all UNIVAC products. The purchase and rental price increases amounted to 5 percent on those items affected, which include the 1110 mainframe and most of the current peripheral equipment.

UNIVAC listed the continuing upward trend in the general cost of doing business as the reason for its price rise, which closely followed IBM's July 28 announcement of mainframe price increases.

At the same time, UNIVAC announced large reductions in the rental and purchase prices of the 8414 Disc Drives. These lower disc prices will more than offset the increased mainframe prices in some installations using several 8414 Disc Subsystems.

The UNIVAC price changes can be summarized as follows:

	Purchase Price	Monthly Maint.	Monthly Rental
PROCESSORS, MEMORY, & ASSOCIATED FEATURES			
9200 & 9200 II	No change	+7%	No change
9300 & 9300 II	No change	+7%	No change
9400	+5%	+7%	+5%
1106	No change	+7%	+5%
1108	No change	+7%	No change
1110	+5%	+7%	+5%
418 III	+5%	+7%	+5%
494	No change	+7%	+5%
All destandardized products	No change	+7%	No change
PERIPHERAL & COMMUNICATIONS EQUIPMENT			
Fastrand II & III Subsystems	No change	+7%	No change
8410, 8411, & 8440 Disc Subsystems	No change	No change	No change
8414 Disc Subsystem	See list below		
Card Controller	No change	+7%	No change
Uniservo VIII C Subsystem	No change	+7%	+5%
FH-880 Drum Subsystem	No change	+7%	+5%
Communication/Symbiont Processor	See list below		
Uniscope 100 & 300 Displays	No change	+7%	No change
DCT 500, 1000, & 2000 Terminals	No change	+7%	No change
1700 Series Card Keypunches	No change	No change	No change
Other current products	+5%	+7%	+5%
All destandardized products	No change	+7%	No change

8414 DISC SUBSYSTEM*

		Purchase Price	Monthly Maint.	Monthly Rental
8414-92	Two Disc Drives; 58 million bytes	$ 33,000	$130	$ 820
8414-94	Four Disc Drives; 116 million bytes	66,000	260	1,540
8414-96	Six Disc Drives; 174 million bytes	99,000	390	2,160
8414-98	Eight Disc Drives; 232 million bytes	132,000	520	2,680
8414-85	Single Disc Drive for configuration expansion	16,500	65	410

COMMUNICATION/SYMBIONT PROCESSOR*

		Purchase Price	Monthly Maint.	Monthly Rental
F1290-00	Asynchronous CLT	$ 576	$ 5	$ 12
F1290-01	Asynchronous CLT	576	5	12
F1290-02	Asynchronous CLT	576	5	12
F1290-03	Asynchronous CLT	576	5	12
F1290-04	Asynchronous CLT	576	5	12
F1291-00	Synchronous CLT	2,160	10	45
F1291-01	Synchronous CLT	2,160	10	45
F1291-02	Synchronous CLT	2,160	10	45
F1291-04	Synchronous CLT	3,120	10	65

*Prices are unchanged for all components of the 8414 and C/SP Subsystems not listed here. ☐

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