Sperry Univac 1100/80 System

MANAGEMENT SUMMARY

First delivered in 1977, the 1100/80 is the middle member of the currently active 1100 Series family of large-scale computer systems. In terms of performance, the 1100/80 fits between the smaller 1100/60 (Report 70C-877-12) and the top-of-the-line 1100/90 (Report 70C-877-16). The 1100/80 is upwardly compatible with the 1100/90 and supports the same peripheral devices and the same software.

The 1100/80 also supports the Array Processor Subsystem (APS), a powerful "number cruncher" designed for high-volume mathematical applications. Thus far, the APS is available for the 1100/80 only.

PROCESSORS

All 1100/80 systems are based on the same 50-nanosecond central processor. Featuring multi-layer printed circuit boards, emitter-coupled logic (ECL), and a buffer memory, the 1100/80 systems can have up to 8 million words (32 million bytes) of real memory and are available in either uniprocessor or multiprocessor configurations.

A large backing store of moderate speed has been combined with a high-speed buffer to support the processing components. In this way, more real memory is available to the user. Either four or eight words at a time are fetched from the backing store into the buffer. All programs and data are loaded in the buffer for execution. Buffer storage ranges from 4K to 32K words. Backing storage ranges from 512K to 8192K words.

The 1100/80 systems are available in five basic models: the 1100/80, 1100/81, 1100/82, 1100/83, and 1100/84. The 1100/80 and 1100/81 are uniprocessor models, and the 1100/82, 1100/83, and 1100/84 have two, three, and four ▷

The 1100/80 is a large-scale computer system available in a number of different configurations. The system can perform effectively in a broad range of applications, including batch and interactive processing, engineering/scientific applications, and business data processing.

MODELS: 1100/80, 1100/81, 1100/82, 1100/83, and 1100/84.
CONFIGURATION: From 512K to 8192K words of main memory, from 1 to 4 CPUs, and from 4 to 104 I/O channels.
COMPETITION: Burroughs B 6800/7800, Honeywell DPS 8, IBM 303X Series.
PRICE: Purchase prices range from $1,389,628 to $6,128,808.

CHARACTERISTICS

MANUFACTURER: Sperry Univac Division, Sperry Corporation, P.O. Box 500, Blue Bell, Pennsylvania 19424. Telephone (215) 542-4011.

MODELS: 1100/80, 1100/80S, 1100/81, 1100/82, 1100/83, and 1100/84.

DATA FORMATS

BASIC UNIT: 36-bit word. In main storage, each word location includes four additional parity bits.

FIXED-POINT OPERANDS: One 36-bit single precision word. Addition and subtraction can also be performed upon 2-word (72-bit) double precision operands and upon 18-bit half-words and 12-bit third-words; the leftmost bit 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. The 1100/80 can also perform decimal addition and subtraction operations on 9-bit bytes, packed 4 to a word. ▶
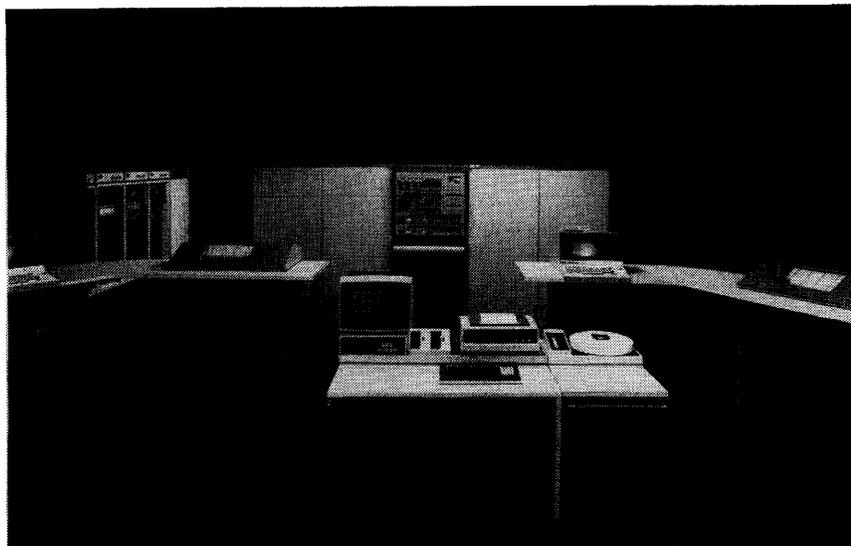
The Sperry Univac 1100/80 is available in five distinct models: the low-end 1100/80, the single-processor 1100/81, the dual-processor 1100/82, the three-processor 1100/83, and the four-processor 1100/84. The 1100/80 is compatible with other members of the 1100 Series family.

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▷ processors, respectively. All five models are also available in a second version that includes the Scientific Accelerator Module (SAM), which is optional on the basic systems. SAM increases the execution speeds of floating-point and extended fixed-point arithmetic functions. Acccording to Sperry Univac, SAM provides performance increases of up to 15 percent.

A third group of 1100/81 through 1100/84 processors includes SAM and also provides support for Sperry Univac's Array Processor Subsystem. Introduced for the energy industry, the APS is a powerful special-purpose computer designed to process large quantities of numerical data. Each array processor unit can operate at up to 120 million floating-point operations per second.

PERIPHERALS AND COMMUNICATIONS

Mass storage devices available for the 1100/80 system include the 8430, 8433, and 8434 removable-media disk drives and the 8450, 8470, and 8480 fixed-disk drives. The 8430, 8433, and 8434 disk drives provide capacities of 17, 34, and 67 million words (77, 154, and 243 million bytes), respectively. The 8450 provides 54 million words (243 million bytes) of storage, while the 8470 provides 89.6 million words (403 million bytes). The 8480, introduced in conjunction with the 1100/90 processor, has a storage capacity of 358 million words (1.6 billion bytes).

Sperry Univac offers a variety of magnetic tape drives in both 7- and 9-track models, with data transfer rates ranging from 34,160 to 1,250,000 bytes per second. Also available are six line printer models with speeds ranging from 760 to 2000 lines per minute and a laser printer with a print speed of 10,500 to 21,000 lines per minute.

Data communications capabilities are strongly emphasized. The DCP/40 Communications Processor can handle from 16 to 156 communications lines and contains from 512K to 2048K bytes of memory. The DCP/40 can be used as a front-end processor, nodal processor, or remote concentrator, and is supported by Telcon software. The DCP/40 will handle data rates of 45 to 1.3 million bps as well as automatic answering and dialing. The DCP/40 supports UDLC, bisync, synchronous and asynchronous transmission.

The newer DCP/20 is a smaller version of the DCP/40. It supports 256K to 512K bytes of memory, 1 to 3 I/O processors, and up to 48 communications lines.

In addition to the DCPs, the 1100/80 also supports the older General Communications Subsystem (GCS) and the Communications Symbiont Processor (C/SP). The GCS supports communications networks of up to 32 half- or full-duplex lines at up to 50,000 bits per second. The C/SP is a programmable front-end communications processor that can be used for message staging, audit trail preparation, and store-and-forward message switching applications. The C/SP supports up to 64 full-duplex or 128 half-duplex communications lines. ▷

▶ **FLOATING-POINT OPERANDS:** One word, consisting of 27-bit-plus-sign fraction and 8-bit exponent for single precision; or two words, consisting of 60-bit-plus-sign fraction and 11-bit exponent for double precision. The range for single precision is from 10 to the 38th power to 10 to the minus 38th power with 8-digit precision; for double precision, the range is 10 to the 307th power to 10 to the minus 308th power with 18-digit precision. The sign is the most significant bit in single precision (bit 35) and double precision (bit 71). Negative floating point numbers are represented by the ones complement of the entire corresponding positive floating point number. Single precision negative exponents are biased by 128, while double precision negative exponents are biased by 1024.

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: Sperry Univac communications terminals and other I/O units can employ a 6-bit Fieldata code or standard ASCII code. The 1100 processors are not code-sensitive and can manipulate data in 6-bit, 9-bit, 12-bit, or 18-bit codes.

MAIN STORAGE

STORAGE TYPE: Metal oxide semiconductor (MOS).

CAPACITY: 524,288 to 8,388,608 words (2,097,152 to 33,554,432 bytes), in 524,288-word banks. Two banks can be housed in one cabinet, with a maximum of four cabinets.

CYCLE TIME: 1250 nanoseconds per 8 words. Each storage module operates independently, permitting overlapped accessing of instructions and data when they are located in different modules.

CHECKING: A parity bit with each half-word is checked whenever storage is referenced and on all I/O transfers. In main storage, a 7-bit error correction code is generated for each word for all read and write operations. Single-bit errors are corrected automatically, and multiple-bit errors cause a data parity interrupt.

STORAGE PROTECTION: The Storage Limits Register, loaded by the Operating System, defines the upper and lower boundaries of both the instruction areas and data areas 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.

BUFFER STORAGE

STORAGE TYPE: IC semiconductor.

CAPACITY: 4,096 to 32,768 words (16,384 to 131,072 bytes), in 4,096-word modules. Buffer storage is located in the Storage Interface Unit (SIU). The basic SIU contains 4K words of buffer storage and can be expanded by the addition of a 4K-buffer expansion for a total of 8K words. In addition, a second 4K-word buffer can be added, and this can also be expanded to 8K words, giving a maximum buffer size of 16K words in the SIU. The second buffer is functionally independent of the first. An additional SIU must be added to systems with three or four processors, providing a maximum of 32K words per system. The 1100/80 series systems that support the Array Processor Subsystem have a minimum of 8K words of buffer storage in one module.

ACCESS TIME: 100 nanoseconds per word. ▶

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1100/80 SYSTEM SUMMARY

Configurations	CPUs	IOUs	Main Storage, Words	Buffer Storage, Words	System Transition Units	System Maintenance Units
1100/81	1	1-2	512K to 8192K	8K-16K	1	1
1100/82	2	1-2	1024K to 8192K	16K-32K	1	1
1100/83	3	2-4	1536K to 8192K	24K-32K	1	2
1100/84	4	2-4	2048K to 8192K	32K	1	2

▷ Sperry Univac's Distributed Communication Architecture, first announced in November 1976, continues to be a viable technology in the vendor's overall communications philosophy. Under the DCA concept, according to Sperry Univac, continued compatibility of present and future products will be ensured by specifying interfaces and functions of all components and providing guidelines for the building of communications networks. DCA can accommodate a broad range of host processors and terminal attachments, including other manufacturers' equipment. Adaptable to both simple and complex networks, DCA is said to permit the design of networks that fulfill many specialized requirements, such as maximum-security, ultra-resilient, and low-overhead systems.

SOFTWARE

The 1100 Operating System is the standard operating system for all members of the 1100 Series, and furnishes comprehensive supervisory and control facilities for three distinct modes of multiprogrammed operation: batch, interactive, and real-time (or communications). It provides virtually the full gamut of desirable operating facilities, including dynamic storage allocation, re-entrancy, multiprocessing, dynamic reconfiguration, automatic recovery, multi-level prioritization, and system optimization.

Software facilities that operate under the control of the 1100 Operating System include processors for the Cobol, Fortran, Algol, Basic, Pascal, PL/1, APL, RPG, and Assembly languages, plus a variety of utility routines and applications packages.

Sperry Univac, like most other mainframe manufacturers, places a strong marketing emphasis on data base and data communications software. The new Universal Data System (UDS) 1100 is a collection of programs designed to provide a single unified data management subsystem. UDS 1100 components include the UDS 1100 Control, Data Management System (DMS) 1100, Processor Common Input/Output System (PCIOS) 1100, Relational Data Management System (RDMS) 1100, Data Dictionary System (DDS) 1100, Define File Processor (DFP), Integrated Recovery Utility (IRU), and File Administration System (FAS). ▷

▶ CENTRAL PROCESSORS

All 1100/80 systems utilize the same 200-nanosecond central processor, which performs all arithmetic and instruction sequencing operations. Input/output operations are performed by independent I/O units. Each central processor includes interfaces to the I/O unit, storage interface unit, system maintenance unit, and system transition unit. Also included is the interprocessor interrupt interface, which provides for the connection of a second CPU.

REGISTERS: The General Register Stack (GRS) includes 128 program-addressable control registers, which are 36-bit integrated-circuit registers with a basic cycle time of 50 nanoseconds. Effective use of multiple accumulators and index registers for the development and use of constants, index values, and operands substantially improves CPU performance. Four of the accumulators (A registers) overlap four of the index registers (X registers); this means they can be used as either A or X registers, providing additional versatility in their use. User programs can make use of 15 index registers, 16 accumulators, 16 special registers, and 4 unassigned registers that are available as temporary storage locations.

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: The 1100/80 has 219 instructions. To a great extent, the instruction repertoire is identical with that of the other 1100 Series systems in order to maintain compatibility. To utilize the full capabilities of the 1100/80 system, character manipulation instructions and additional privileged instructions are included.

PROCESSOR MODES: When a processor 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 Operating 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. ▶

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▷ Data communications software includes the Communications Management System (CMS) 1100, which provides the communications interface to a DCA-based DCP/Telcon network, and the Processor Common Communication System (PCCS), which enables applications programs to utilize the communications system.

The following end-user-oriented software systems are available to facilitate the development of transaction processing and management information systems: the Remote Processing System (RPS) 1100, a system that allows nonprogrammers to interactively develop and use their own file management applications from remote CRT terminals; Query Language Processor (QLP) 1100, an English-language batch or interactive interface to DMS 1100; Mapper 1100, a real-time report processing system; and ADVISE 1100, an application development tool.

The Interactive Processing Facility (IPF) consists of eight modules that provide a user interface to the 1100/80 system. IPF includes data management and distributed processing capabilities, security features, and terminal session control capabilities.

COMPATIBILITY

Within the 1100 Series, Sperry Univac has maintained a high degree of program and data compatibility. This has been continued with the 1100/80, both on the source and object level. There is no direct program compatibility, at the machine or assembly-language level, between the 1100 Series and any other line of Sperry Univac or competitive computers. The 1100 Series implementations of the Cobol, Fortran, Algol, Basic, PL/1, and Pascal languages, however, are generally in accordance with the accepted standards for these languages. The 1100 Series systems originally used the 6-bit Fieldata code, but in an effort to resolve the resulting compatibility problems, Sperry Univac has gradually revised most of the hardware and software to make use of ASCII. Thus, for most practical purposes, an 1100 Series computer can now be considered a byte-oriented ASCII machine.

COMPETITIVE POSITION

The 1100/80 systems are directly competitive with the Honeywell DPS8/70 and the IBM 303X Series processors. The 1100/82 Multiprocessor offers slightly better performance than the IBM 3032, and the 1100/83, with three processors, offers slightly better performance than the IBM 3033N. The 1100/82 and 1100/83 also offer the advantages of multiprocessing and hardware redundancy.

For scientific applications, the 1100/80 with the Array Processor Subsystem competes with such systems as the Cray/1 and the Control Data 205. According to Sperry Univac, an 1100/84 with two array processor units has a maximum speed of 250 million floating-point operations per second, while the Cray/1 and CDC 205 operate at 160 and 200 million floating-point operations per second, respectively. ▷

▶ SYSTEM TRANSITION UNIT (STU): Contains the controls and indicators required for control and assignment of the system units in an 1100/80 system. Power sequencing, manual control of the CPUs and IOUs, initial load, automatic recovery, and partitioning are controlled by the STU.

The initial load function provides the ability to set module select register (MSR) values, select initial load paths, and initiate the initial load operation for either one of two applications. The MSR selects the section of main storage in which the fixed interrupt addresses are located, and the location in main storage where the instruction execution sequence is initiated on an initial load.

The partitioning function provides the ability to assign individual central complex units of a system to either one of two independent smaller systems, or to isolate a unit from either application for off-line concurrent maintenance. Included in this function is the control for the automatic expansion or compression of main storage address range for both applications. This operation provides main storage ranges from either or both applications for any combination of main storage unit assignments. The partitioning function also indicates the operational status of each central complex unit. These status conditions are available to system software for configuration control. The ability to partition peripheral subsystems is provided by the Subsystem Availability Unit (SAU) and the Byte Channel Transfer Switch (BCTS) or by controls located on the individual subsystems.

SYSTEM MAINTENANCE UNIT (SMU): The SMU provides for diagnostic checkout and fault isolation of the CPU and IOU by the automatic comparison of internal logic status against known correct data. The SMU includes a maintenance processor, card tester, communications capability, and a Uniscope 200 CRT workstation.

ARRAY PROCESSING SUBSYSTEM (APS): A special-purpose scientific processor that enables appropriately configured 1100/80 systems to process large quantities of numeric data. The APS consists of an array processor control unit and an array processing unit with 8K words of instruction memory and 64K words of data scratchpad memory. The APS can perform floating-point arithmetic operations at a maximum burst rate of 120 million operations per second and a sustainable rate of 80 million operations per second. A direct interface to main storage and a high-speed cache memory are provided to increase the data transfer rate. Data can be transferred between the host computer and APS at 35 to 40 million words per second. Real memory problems as large as 8 million words can be executed in a single vector operation. All arithmetic operations are fully compatible with the 1100/80 series host. The 1100/80 series processors that support the APS also include a Scientific Accelerator Module (SAM), a feature designed to improve the execution times of arithmetic instructions.

CONSOLE: The Sperry Univac 4013 System Console consists of a Uniscope 100 or Uniscope 200 CRT display, a typewriter-style keyboard and control panel, and a 30-cps incremental printer for hard-copy output. Up to five additional printers can be connected to a console. A 200-cps console printer is also available. The CRT displays 16 lines of 64 characters each and uses a 7-bit ASCII character set. The System Console also includes a fault indicator, which indicates fault conditions in major system components, and an interface for the Total Remote Assistance Center (TRACE) remote diagnostic capability. The 1100/80 processors can support an unlimited number of system consoles.

INPUT/OUTPUT CONTROL

I/O CHANNELS: The basic 1100/80 Input/Output Unit includes space for four channel modules; three are standard— ▶

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▷ USER REACTION

Datapro's 1982 survey of general-purpose computer users yielded responses from 20 1100/80 users, who had a total of 27 systems installed. The oldest of these systems had been in use since 1977; the newest, since February 1982.

Eighteen of the respondents acquired the 1100/80 as an upgrade from another computer system. In 11 installations, the 1100/80 replaced another 1100 Series system, while in 5 installations it replaced an older Sperry Univac system. Only two of the respondents had converted from a non-Univac system.

All of the respondents developed applications programs in-house. Eleven also obtained programs from the manufacturer, and eight used proprietary software packages. The most frequently used programming language was Cobol (18 responses).

Summarized in the following table are the users' ratings of the 1100/80 hardware, software, and support.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	10	9	1	0	3.45
Reliability of mainframe	11	9	0	0	3.55
Reliability of peripherals	6	11	2	1	3.10
Maintenance service:					
Responsiveness	11	7	2	0	3.45
Effectiveness	7	10	2	1	3.15
Technical support:					
Trouble-shooting	4	8	7	1	2.75
Education	2	5	9	4	2.25
Documentation	3	5	8	4	2.35
Manufacturer's software:					
Operating system	13	7	0	0	3.65
Compilers and assemblers	11	6	3	0	3.40
Applications programs	3	6	4	1	2.79
Ease of programming	7	11	2	0	3.25
Ease of conversion	8	3	8	1	2.90
Overall satisfaction	8	8	4	0	3.20

*Weighted Average on a scale of 4.0 for Excellent.

In September 1982, we interviewed three of the survey respondents to gain additional insight into their experiences with the 1100/80.

The first user interviewed represented a Western state government agency that had installed an 1100/82 in July 1980. The 1100/82 replaced a Sperry Univac 9400 and a Series 90 system. This user said he had redesigned the database and rewritten his programs to take advantage of the 1100 Series software. Although the process took about two years, he said the "time has paid for itself." The user was well satisfied with the system and planned to acquire additional software and data commmunications facilities.

The second user, a southern manufacturer, had leased an 1100/80 in February 1982 as an upgrade from an 1100/11 system. He said no conversion was required and the 1100/80 was installed over a weekend. This user said that he was "very pleased with the system" and that he had experienced no downtime with the CPU or with the 8450 ▷

a byte multiplexer channel, a block multiplexer channel, and a word channel module (four word channels)—and one more is optional. Up to 8 channel modules including byte multiplexer, block multiplexer, and/or word channel modules, can be accommodated per input/output unit for a total of 32 per 1100/80 system. Each byte or block multiplexer channel has eight shared subchannels and is capable of controlling up to eight subsystems. Four word channels share one word channel module, so an IOU may have as many as 24 word channels. Two of the four word channels in each module may be Externally Specified Index (ESI) channels. An ESI word channel can handle up to 32 full-duplex lines, making possible a total of 64 full-duplex lines on the two optional ESI channels in the word channel module.

SIMULTANEOUS OPERATIONS: One input or output operation on each I/O channel can occur simultaneously with computation in each processor (or CPU). 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 processors and IOPs can operate simultaneously and independently, with interference occurring only when two or more of these units simultaneously attempt to access the same storage module.

CONFIGURATION RULES

An 1100/80 System is a limited-configurability version of the 1100/81 (below) that includes 4K words of buffer storage and one of two main memory configurations: 512K or 1024K words. The 1100/80 is fully compatible with the 1100/81 and can be upgraded to 1100/81 status. The 1100/80S is an 1100/80 processor with a Scientific Accelerator Module.

A basic 1100/81 System consists of one Central Processor Unit, one or two Input/Output Units, one to any number of System Consoles, 512K to 8192K words of main storage, one Storage Interface Unit with from 8K to 16K words of buffer storage, one System Transition Unit, one System Maintenance Unit, one motor alternator, and associated peripheral subsystems.

A basic 1100/82 System consists of two Central Processor Units, one or two Input/Output Units, one to any number of System Consoles, 1024K to 8192K words of main storage in a minimum of two Main Storage Units, one or two Storage Interface Units with 16K to 32K words of buffer storage, one System Transition Unit, one System Maintenance Unit, one or more motor alternators, and associated peripheral subsystems.

A basic 1100/83 System consists of three Central Processor Units, two to four Input/Output Units, two or more system Consoles, three to four MSUs capable of controlling 1536K to 8192K words of main memory, 24K to 32K words of buffer storage, one System Transition Unit, two System Maintenance Units, two or more motor alternator units, and associated peripheral subsystems.

A basic 1100/84 System consists of four Central Processor Units, two or four Input/Output Units, two or more System Consoles, four MSUs capable of controlling 2048K to 8192K words of main memory, 32K words of buffer storage, one System Transition Unit, two System Maintenance Units, two or more motor alternator units, and associated peripheral subsystems.

Sperry Univac offers two additional versions of the 1100/81, 1100/82, 1100/83, and 1100/84 processors. One version includes a Scientific Accelerator Module as a standard feature. (The accelerator feature is available as an option on the basic systems described above.) The second version includes both the Scientific Accelerator Module and support for the Array Processor Subsystem. ►

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▷ and 8470 disk drives. He said there had been some mechanical failures in the Uniservo 14 tape drives, but the drives were not used very often.

The third user interviewed represented a Midwestern manufacturer that had replaced a Honeywell 6000 Series system with an 1100/81 system in April 1981. He said the conversion is still in progress and is going well. This user commented that the 1100/81 processor "is good, but it is over priced, takes up too much space, and uses too much power." He said the 1100/81 CPU was reliable, but he had experienced "too much downtime" with the 8470 disk drives. The problem was with the fixed heads, which were finally replaced. He also had problems with the Uniservo 32 tape drives, but their performance has improved.

Despite some negative comments, the user's ratings and comments indicate that they were generally satisfied with the 1100/80, except in the area of technical support. Sixteen users said they would recommend the 1100/80 to others, two said they would not, and two were undecided.□

▶ Minimum peripheral equipment to complete an 1100/80 system includes one 0716 card reader, one 0770 printer subsystem, a disk subsystem with one control unit and two 8434 disk units, and a magnetic tape subsystem with one control unit and four Univservo 30, 32, 34, or 36 magnetic tape units.

As an alternative, a minimum peripheral system would include one 0716 card reader, one 0776 printer subsystem, a disk subsystem with one controller and one 8470 or 8480 disk unit or two 8430, 8433, or 8450 disk units, and a magnetic tape subsystem with one control unit and four Uniservo 14, 16, 22, or 24 magnetic tape units.

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 on 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 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.

8407 DISKETTE SUBSYSTEM: A free-standing cabinet with a control unit and one or two autoloader diskette drives. The drives can use either single- or double-density diskettes. Each single-density diskette has a storage capacity of 250,000 bytes, and each double-density diskette has a capacity of 1,000,000 bytes. The track-to-track seek time is 3 milliseconds, the head settling time is 15 milliseconds, and the head loading time is 35 milliseconds. The average latency time is 83.3 milliseconds. The nominal data transfer rate is 31,000 bytes per second for single-density diskettes and 62,000 bytes per second for double-density diskettes.

Each 8407 diskette drive has an autoloader feed mechanism that can sequentially feed up to 20 diskettes without operator intervention.

8430 DISK SUBSYSTEM: Provides large-capacity random-access storage in interchangeable 11-disk packs with storage capacities comparable to the standard density (100-million-byte) IBM 3330 Disk Storage Subsystem. Each disk pack stores up to 17,194,240 36-bit words (77,374,084 bytes) of data. Minimum and maximum head movement times are 7 and 50 milliseconds, respectively. Average head movement time is 27 milliseconds, average rotational delay is 8.3 milliseconds, and the rotational speed is 3600 rpm. The data transfer rate is 179,111 36-bit words (806,000 bytes) per second.

From two to eight 8430 Disk Pack Drives can be attached to a 5039 Control Unit. The 8430 Disk Drives can also be intermixed with 8433 Disk Drives on the 5039 Control Unit. The F2047-00 Sixteen-Drive Expansion Feature expands the capability of the 5039 Control Unit to up to sixteen 8430 and/or 8433 Disk Storage Drives. A dual-access feature and a second 5039 Control Unit permit simultaneous read and write operations on any two 8430 Disk Drives. The 8430 features a command retry facility and error correction coding circuitry.

8433 DISK SUBSYSTEM: Provides random access to very large quantities of data stored on removable "double-density 3330-type" disk packs. Each industry-standard disk pack contains 200 million bytes in Free Format recording mode. When the data is stored in records of 112 words each, it has a capacity of 34,388,340 36-bit words (154,748,160 bytes). There are 20 records of 112 words each per track and 808 tracks (plus 7 spares) on each of the 19 recording surfaces. Minimum, average, and maximum head positioning times are 10, 30, and 55 milliseconds, respectively. Drive rotation is 3600 rpm with an average rotational delay of 8.3 milliseconds. Data transfer rate is 179,111 36-bit words (806,000 bytes) per second.

From two to eight 8433 Disk Pack Drives can be connected to a 5039 Control Unit for a total of 275 million words per subsystem. (See the 8430 section above for expansion capabilities.) The 8433 also includes the command retry facility and error correction coding circuitry. For additional configuration information, see the 8470 Disk Subsystem.

8434 DISK SUBSYSTEM: Consists of a 5046 Storage Control Unit and from 2 to 16 (in any combination) 8430, 8433, or 8434 disk drives. Up to 16 additional disk drives can be added to the 5046. For additional configuration information, see the 8430 Disk Subsystem.

Each 8434 Disk Drive stores up to 54,183,136 words (243,824,110 bytes). Minimum, average, and maximum head movement times are 10, 30, and 55 milliseconds, respectively. The drive has a rotational speed of 3600 rpm and a rotational delay of 8.3 milliseconds. The data transfer rate is 279,333 words (1,257,000 bytes) per second.

8450 DISK SUBSYSTEM: The 8450 Disk Drive provides up to 54,079,200 words (243,356,400 bytes) of storage. The fixed head disk assembly (HDA) provides eight platters with 15 surfaces used for data and one surface for servo control. The bottom surface of the lowest platter provides data storage under control of an optional 60-head fixed-head assembly. Each 8450 has the optional capability of 181,888 words of ▶

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▶ fixed-head storage. Data is recorded on 1110 moving-head and 56 fixed-head tracks per surface in 29 records of 112 words per track.

Minimum, average and maximum head movement times are 4, 23, and 46 milliseconds, respectively. The drive has a rotational speed of 3600 rpm and a rotational delay of 8.3 milliseconds. Transfer rate for the drive is 280,000 words (1,260,000 bytes) per second.

The 8450 Disk Drive connects to a word channel through the 5046 Storage Control Unit, which permits the drives to be intermixed with 8430 and 8433 disk drives. The 5046 SCU can control up to 16 drives, and can be expanded to provide control for up to 16 additional drives through the F2837-00 Power Control Expansion. Disk drives are attached to the 5046 SCU in groups of four. Each group can consist of either 8430/8433 drives or 8450 drives. The 8450 disk drives can also be adapted for dual access by addition of the F2718-99 Dual Access Feature, which permits simultaneous Read/Write, Read/Read, Write/Read, and Write/Write access on any two drives. Additonal features of the 5046/8450 subsystem include rotational position sensing, error correction facilities, and enhanced command retry. The 8450 may also be attached to the 8470 or 8480 Subsystem; see the next entries.

8470 DISK SUBSYSTEM: Consists of the 5056-83 controller and the 8470 Disk Drive. This drive, an enhanced version of the 8450, provides up to 89,600,000 words (403,200,000 bytes) of storage. The HDA consists of nine platters with 16 surfaces used for data and one surface of the remaining platter used for servo control.

The bottom surface of the lowest platter provides data storage under control of an optional 60-head fixed-head assembly. Data is recorded on 56 of these tracks with 6 spares. Movable head assemblies with two heads per surface provide the means for recording on the other 14 surfaces. These heads each cover 625 tracks plus 5 spares. Each 8470 has the optional capability of 338,688 words of fixed-head storage. Data is recorded on 1250 moving-head and 56 fixed-head tracks per surface in 40 records of 112 words per track.

Minimum, average, and maximum head movement times are 4, 23, and 46 milliseconds, respectively. Head positioning time for the fixed-head option is 8.3 milliseconds (rotational delay factor). The drive has a rotational speed of 3600 rpm and a rotational delay of 8.3 milliseconds. Transfer rate for the drive is 466,000 words (2,097,000 bytes) per second.

The 5056-83 controller can attach up to eight 8470 Disk Drives with or without the fixed-head option. The F3192-02 feature allows for the attachment of eight additional 8470 drives or two 8480 drives to the 5056-83. Up to three F3192-02 features are allowed per controller, thus providing for a maximum of 32 8470 drives per 5056-83. The F3192-00 and F3192-01 features allow for the attachment of up to eight 8430/8433 and 8450 Disk Drives, respectively. Dual access may be added to the 8470 with feature F2718-00.

8480 DISK SUBSYSTEM: The 8480 Disk Drive includes four HDAs that provide a total storage capacity of 358,400,000 words (1,612,800,000 bytes) of storage. Each HDA consists of 8 platters with 16 recording surfaces. Data is recorded on 1260 tracks per surface in 40 records of 112 words per track. Minimum, average, and maximum access times are 4, 23, and 46 milliseconds, respectively. The drive has a rotational speed of 3600 rpm. The data transfer rate is 466,000 words (2,097,000 bytes) per second.

The 8480 Disk Subsystem includes two dual-access controllers and two 8480 disk units. The controllers support up to eight 8480 drive units. The F3192-99 and F3192-98 Attachment Features allow the attachment of up to eight 8430/8433 or eight 8450 disk drives, respectively. The F3192-

97 Attachment feature permits the attachment of up to eight 8470 or two additional 8480 drives. Up to three attachment features can be added. All disk drives in the subsystem must have a dual-access capability.

CACHE/DISK SYSTEM: A hierarchical mass storage system that provides a level of memory between the 1100/80 processor and 8450, 8470, or 8480 disk drives. The Cache/Disk System consists of one or two 5057 Cache/Disk Processors, up to four 7053 Storage Units, and up to eight 8450, eight 8470, or two 8480 disk units (16 drives maximum).

The 5057 Cache/Disk Processor controls all data access functions including indexing, searching, buffering, storage management, staging and destaging of data to and from disk, and error recovery. The 7053 Storage Unit contains 917,504 words (4 megabytes) of semiconductor memory. It can be configured as cache memory, as a solid-state disk, or both.

In Cache/Disk mode, data is automatically transferred from the disk to the 7053 Storage Unit. The host computer accesses data as if it were stored on the disks. A separate indexing feature, the Segment Descriptor Table (SDT), is required in one of the 7053 units. The SDT contains a list of disk addresses that point to cache storage areas containing duplicates of data in recently referenced disk space. When an index find occurs, data transmission between the cache and the host CPU begins in about one millisecond. If an index miss occurs, the 5057 processor issues a seek to disk and disconnects for other activity.

In Solid-State Disk mode, the 7053 is directly addressed by the host processor. The access time in this mode is approximately 0.2 millisecond. In both Cache/Disk and Solid-State Disk modes, the response time is improved by eliminating the seek and latency time required by the disk drives.

In addition, the Cache/Disk System permits the use of larger disk record sizes thus maximizing the capacity of disk storage. In Cache/Disk mode, data is transferred from the 8450 disk unit in segments of 448 words and from the 8470 and 8480 disk units in segments of 1792 words. Using the 448-word format, each 8450 stores up to 67 million words. Each 8470 stores up to 143 million words (645 million bytes) using the 1792-word format. Using the same 1792-word format, the 8480 stores up to 573 million words (2580 million bytes).

INPUT/OUTPUT UNITS

UNISERVO 14 MAGNETIC TAPE UNIT: A medium-speed tape drive that reads and records data on standard 1/2-inch tape in IBM-compatible phase-encoded or NRZI formats. Available in both 9-track and 7-track versions. Tape speed is 60 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 96,000 bytes per second. The optional Dual Density feature permits operation at 800 bpi (in NRZI Mode) at a data rate of 48,000 bytes per second, while the 7-track NRZI version operates at 200, 556, or 800 bpi, with data rates of 12,000, 33,400, or 48,000 characters per second.

The Uniservo 14 Magnetic Tape Units use the 5045 control Unit, which includes the controller and housing for two magnetic tape units. A maximum of eight tape units can be attached to each 5045 Control Unit. Features available with the Uniservo 14 include automatic tape loading, dustproof wraparound tape cartidges, single-capstan drive, and a dual-channel option that permits non-simultaneous operation on two channels on a single processor or shared operation between two central processors.

UNISERVO 16 MAGNETIC TAPE UNIT: A high-speed tape drive that reads and records data on standard 1/2-inch ▶

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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 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 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.

UNISERVO 22/24 MAGNETIC TAPE UNITS: High-performance tape drives that match the performance of the IBM 3420 Model 7. Both models are 9-track, 800/1600-bpi tape drives designed for NRZI and PE recording. The Uniservo 22 has a transfer rate of 120,000 bytes per second at 1600 bpi and 60,000 bytes per second at 800 bpi. The Uniservo 24 transfers data at 200,000 bytes per second at 1600 bpi and 100,000 bytes per second at 800 bpi. Tape speed is 75 ips on the Uniservo 22 and 125 ips on the Uniservo 24. Operational conveniences include a power window, automatic tape threading, and wraparound tape cartridge loading.

The Uniservo 22 subsystem consists of a control unit and two Uniservo 22 tape units in a single cabinet. The Uniservo 24 subsystem includes a control unit and two Uniservo 24 tape units in a single cabinet. Both subsystems support up to eight Uniservo 22 and/or Uniservo 24 magnetic tape units.

UNISERVO 30 SERIES TAPE UNITS: High-performance units that record data on 1/2-inch tape in IBM-compatible formats. There are five models in the series, three of which use Group Coded Recording (GCR) at a density of 6250 bits per inch. All five models use the Uniservo 5042 Control Unit, and Uniservo 30 series tape units can be intermixed in any combination on the same subsystem, provided the proper control unit is included to accommodate the various tape unit types. The basic control unit can handle one to eight Uniservo 30 series tape units. Optional features in the control unit and the addition of a second control unit, also with appropriate features, permit communication with up to 16 tapes in a dual-access mode. The five models in the Uniservo 30 series and their characteristics are as follows:

- Uniservo 30 (7-track)—a conventional NRZI unit with a transfer rate of 160,000 bytes/second at 800 bpi, 111,200 bytes/second at 556 bpi, or 40,000 bytes/second at 200 bpi. Tape speed is 200 inches/second.

- Uniservo 30 (9-track)—a unit designed for NRZI and PE (phase-encoded) recording. The transfer rate is 320,000 bytes/second at 1600 bpi or 160,000 bytes/second at 800 bpi. Tape speed is 200 inches/second.

- Uniservo 32—a 9-track unit designed for GCR and PE recording. The transfer rate is 470,000 bytes/second at 6250 bpi or 120,000 bytes/second at 1600 bpi. Tape speed is 75 inches/second.

- Uniservo 34—a 9-track unit designed for GCR and PE recording. The transfer rate is 780,000 bytes/second at 6250 bpi or 200,000 bytes/second at 1600 bpi. Tape speed is 125 inches/second.

- Uniservo 36—a 9-track unit designed for GCR and PE recording. The transfer rate is 1,250,000 bytes/second at 6250 bpi or 320,000 bytes/second at 1600 bpi. Tape speed is 200 inches/second.

0770 PRINTERS: These printers employ a horizontally moving print band and combine various convenience, maintenance, and availability features. The three models differ only in their speeds, offering 48-character printing rates of 800, 1400, or 2000 lines per minute and 24-character printing rates of 1435, 2320, and 3000 lpm. The printers, each of which contains an integral control unit, can be connected to an 1100/80 system via a word channel.

Printing speeds for 48-character sets are 800 lines per minute for Model 0770-00, 1400 lines per minute for Model 0770-02, and 2000 lines per minute for Model 0770-04. The respective skipping speeds for the three models are 50, 75, and 100 inches per second. All can have character sets from 24 to 384 characters in size, and all have 132 print positions as standard. An optional feature for all models can increase the number of print positions to 160 without affecting the print speed. All have a single-space print time of 8.75 milliseconds, line spacings that are operator-selectable at 6 or 8 lines per inch, and forms dimensions from 3.5 to 22 inches wide and up to 24 inches long.

0776 PRINTER SUBSYSTEM: An impact printer subsystem that offers a choice of three line speeds: the Model 0776-00 prints a 48-character set at 760 lines per minute, the Model 0776-02 at 900 lines per minute, and the Model 0776-04 at 1200 lines per minute. Skipping speed for all models is 22 inches per second. Vertical spacing is operator-selectable at either 6 or 8 lines per inch. All models can have character sets ranging from 24 to 384 characters in size, and have 136 print positions as standard equipment. Printing takes place at 10 characters per inch. The 0776 printers have a single-space print time of 14.2 milliseconds and a single line space time of 16 milliseconds. Forms ranging from 4 to 18.75 inches wide and up to 24 inches long can be accommodated.

The 0776 Printer Subsystems also feature a program-loaded vertical format buffer in place of a paper tape format loop, swing-out print carriages, easy ribbon replacement without rewinding, simplified line finding, lighted print areas, automatic print gap (forms thickness) adjustment, powered, program-controlled top covers, automatic power forms stackers, and enhanced acoustical covers to reduce operating noise.

0777 PRINTER SUBSYSTEM: The 0777 printer is a high-speed non-impact printer that uses laser technology. The printer operates at a print rate of 159 eleven-inch pages per minute, ranging from 10,500 to 21,000 lines per minute. Line spacing of 6, 8, and 12 lines per inch and character spacing of 10, 12, and 15 characters per inch are available. A variety of character sets are available and are stored on the system diskette. For further details on the 0777 laser printer, please refer to Report 70D7-877-01 in Volume 2.

0716-89 CARD READER AND CONTROL: Reads 80-column cards serially by column at 1000 cpm. Has a 2400-card input hopper and two 2000-card stackers. Can read data in EBCDIC, ASCII, Compressed Code, or card image mode. Optional features permit reading of 51- or 66-column cards, validity checks, stacker feature permitting the alternate filling of stackers one and two when in the "stop on errors" mode, and dual translate. Connects to an 1100/80 system via a word channel.

0604-99 CARD PUNCH: Punches 80-column cards in row-by-row fashion at 250 cards per minute. Has a 1000-card input hopper and two 1000-card output stackers. Punched cards are directed to one of the two stackers under program control. Punching is in card-image mode or compressed code translation. Contains an integrated controller and connects to an 1100/80 system via a word channel.

COMMUNICATIONS CONTROL

DCP/TELCON: Telcon is an intelligent communications system that provides basic hardware, software, and

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▶ peripherals for users with large communications networks. The system can operate as a front-end processor for 1100/80 and other 1100 Series host processors, as a network nodal processor, or as a remote concentrator. As such, it provides networks that support real-time, time-sharing, remote job entry, and message switching applications. The major components of Telcon are the Distributed Communications Processor (DCP) and the Telcon network software. Multiple DCPs can be combined to form a node of high throughput and processing capability.

The original DCP and the newer DCP/40 are independently operating communications processors designed to perform as front ends, remote concentrators/terminal controllers, stand-alone network nodes, or in a combination of these roles at the same time. The newer DCP/20, a smaller version of the DCP/40, can serve as a front-end processor or as a remote concentrator.

The DCP/20 system consists of a processor with 256K to 512K bytes of memory, one to three I/O processors, and communications line modules. The main processor performs both generalized communications processing and input/output processing; the I/O processors perform input/output processing only.

The DCP/20 processor and each I/O processor provide programmed control for up to 16 data paths, which can be a combination of serial lines to remote equipment, channels to peripheral devices, or channels to on-site host Series 1100 or Series 90 processors. Each operational port on the I/O processors requires one line module, which provides an interface to a line and performs various communications functions such as control character recognition and line timing. DCP/20 accommodates asynchronous, synchronous, and wideband transmission at up to 64K bits per second. It supports Universal Data Link Control as well as character-oriented communications protocols.

The DCP/40 represents a significant increase in performance and throughput over the original DCP, primarily through the introduction of multiple microprocessors and microcoded message handlers.

Main memory ranges from a minimum of 512K to 2048K bytes, expandable in 512K-byte increments. A maximum DCP/40 may include up to 16 I/O processors, each of which provides program control for up to 16 communications channels. Each can handle a mixture of remote lines, parallel interfaces and host channel connections. Each I/O processor is programmed separately using a set of over 60 macroinstructions and each handles, in addition to data transmission and receipt, remote terminal polling, error checking and recovery, dynamic buffer allocation, reporting of line status, and recording of error and traffic statistics.

The increased memory permits larger and more complex user applications to be included in a single DCP. In addition, the DCP/40 may front-end either 1100 Series or 90 Series mainframes, and supports up to 256 half- or full-duplex communications lines.

The DCP/20 and DCP/40 are modular hardware systems that can be tailored to meet the needs of a broad range of users. The network software, Telcon, like the hardware, is also modularly structured and readily tailored by the user. A repertoire of over 285 instructions is available to the user for the generation, assembly and loading of message handling routines.

Terminal handlers in the DCPs, software and firmware, are available for most standard Sperry Univac terminal devices, as well as several non-Univac terminals including Teletype and IBM 3270 and 2780/3780 batch. Other software modules handle particular line protocols such as the UDLC trunk lines, or access links to/from X.25 packet switching services.

In addition to off-loading the host, the DCP lends a degree of network reliability and resiliency to the user. The standalone capability of a single network DCP may permit continued message acceptance and storage of data during periods of temporary inaccessibility to a given host or terminal. Similarly, multiple DCPs may be redundantly configured to maximize network uptime or increase network throughput.

COMMUNICATIONS/SYMBIONT PROCESSOR (C/SP): An independently programmed computer designed to relieve the 1100/80 central processors 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 Sperry Univac 9400 Processor. It offers 32K, 48K, 64K, 96K, or 128K bytes of MOS 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 eight or sixteen 32-bit general registers.

A minimum C/SP configuration includes a processor with 32K to 128K bytes of storage, 1100 Series Channel Adapter, Maintenance Panel, Interval Timer, Power Failure Interrupt Feature, Storage Protection Feature, Special Device Channel, and an 80-cpm card reader. Optional features include a Multiplexer Channel, Selector Channel, one or two General-Purpose Comunications Channels, and one additional 1100 Series Channel Adapter.

The 1100 Series Channel Adapter 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 100,000 36-bit words per second. The Special Device Channel is used mainly for local progam loading and maintenance of the C/SP by means of an 80-cpm serial card reader. The optional Multiplexer Channel permits attachment of up to eight byte-oriented peripheral subsystems. The optional Selector Channel permits the attachment of one tape controller with up to 16 Uniservo 16 7-track and/or 9-track magnetic tape units.

Each of the two optional General-Purpose Communications Channels (GPCCs) 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 CLTs are available to handle a wide range of communications facilities and transmission speeds.

TERMINALS: The following Sperry Univac devices, most of which are described elsewhere in DATAPRO 70, are supported for use as remote terminals with the 1100 Series systems: the Uniscope 100 and Uniscope 200 (Report 70D2-010-15), UTS 400 (Report 70D1-877-01), and the 1900 Computer Aided Data Entry System (report 70D4-877-31). Support for IBM's binary synchronous communications protocol also permits transfer of data between IBM System/360 and System/370 and Sperry Univac 1100 Series systems and the use of some IBM-compatible remote batch terminals.

SOFTWARE

OPERATING SYSTEM: All 1100 Series systems utilize the 1100 Operating System, which supports batch, transaction, real-time, and interactive processing in multiprogramming, multiprocessing, and distributed processing environments. ▶

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▶ The heart of the 1100 Operating System is the Executive, which supports user program processing.

Batch processing jobs can be submitted either locally or remotely. A scheduling routine selects the runs to be initiated in accordance with user-assigned priorities and deadlines.

The demand processing facilities of the 1100 Operating System permit interactive use of the system by multiple users at remote terminals. By means of the Executive Control Language, demand-mode users can compile and execute programs, use library facilities, and communicate with the computer center and with other terminals. (More comprehensive facilities for interactive operations are provided by the Interactive Processing Facility, Conversational Time-Sharing, and High-Volume Time-Sharing systems, described later in this report.)

Real-time and communications programs, which are subject to specific time constraints, receive top-priority handling by the 1100 Operating System. Real-time programs receive privileged access to system resources such as central processors, memory, and input/output channels, and have a priority higher than any other processing except for Executive interrupt processing. Interrupt processing routines can be defined for each real-time communications line; they execute at a higher priority than all other processing. Communications control facilities for transaction processing are provided by the Communications Management System and the Transaction Interface Package, described later in this report.

Multiprocessing is handled as a logical extension of the 1100 Executive's multiprogramming capabilities. The system maintains a list of processor activities currently waiting to be performed. Each processor inspects this list, selects a task, and executes it. One processor can interlock the others while referencing critical areas of common data, and various other techniques are employed to guard against inter-processor interference.

A number of *system management tools* are available for Executive system management, upgrading, and testing. These include the Customer On-site Maintenance and Installation System (COMUS), the Quota system, and Fault Location by Interpretive Testing (FLIT).

The Customer On-Site Maintenance and Installation Subsystem (COMUS) facilitates the installation and maintenance of the Executive software and program products. COMUS provides a high-level interface that directs an automatic system generation process. Augmenting COMUS is the Symbolic Stream generator (SSG). Directions and models for building the desired stream images are conveyed to SSG through a skeleton program. The resulting symbolic output streams can be placed in a user-specified file, printed, and dynamically added for execution after SSG terminates. SSG also helps to maintain symbolic input files that may be printed, corrected, and updated for later use.

The Quota System enables 1100 Series installations to control the use of system resources by both batch and demand users. The Quota Input Processor (QUIP) can be used by each installation to establish account and individual limits through user identification codes for use of system resources. With the Quota System, installations can prevent users from requesting the use of system resources beyond an account budget or a preassigned limit, control the number of concurrent demand and batch runs executing in the system, and define limits to be applied to resources available to demand and/or batch jobs at specified times.

Fault Location by Interpretive Testing (FLIT) provides the capability to execute and diagnose the Executive while running as a normal user program under Executive control. Thus, a new version of the Executive or a planned new configuration can be studied and tested in a "virtual" environment prior to its use as the production Executive system.

In addition, the 1100 Executive can dynamically monitor its own activity. The Software Instrumentation Package (SIP) provides a tool for system throughput and response optimization.

A number of *system processors* are also available, including The Terminal Security System (TSS), Sentry, Checkpoint/Restart, Memory Allocation Processor, Post-Mortem Dump Processor (PMD), Element Processor (ELT), Procedure Definition Processor (PDP), File and Program Utility Processor (FURPUR), and Data Processor.

The Terminal Security System (TSS) permits each installation to establish a file of valid remote system users through the use of user identification codes, passwords, and other pertinent information. The system allows installation passwords to be changed dynamically, and enables users to be selected as masters or submasters to allow delegation of authority in creating and updating identifications and passwords in the TSS file. Each installation can define the action to be taken in the event of an attempted security violation.

Sentry is a security control processor that is used to create and maintain a user security profile database, which is then used to control user access to files and certain privileged functions. Checkpoint/Restart snapshots a run or program and creates a checkpoint that may be used for restarting at a later time if desired. The Memory Allocation Processor provides for the collection and interconnection of relocatable elements produced by the compilers to produce an executable program. The Postmortem Dump Processor is a user debugging aid that produces edited dumps of the contents of main storage if the program terminates abnormally. Optionally, a dump can be produced when a program terminates normally.

The Element Processor is used to insert symbolic, relocatable, absolute, or omnibus elements into a program file from images in the runstream. The Procedure Definition Processor processes symbolic elements that may contain Assembler, Fortran, or Cobol procedures and produces entries in the table of contents of a program file. The File and Program Utility Processor consists of a set of file maintenance routines that provide for the management and manipulation of cataloged or temporary files containing data or programs. Finally, the Data Processor provides data handling capabilities at the file level.

COMMUNICATIONS PROCESSING: The 1100 Operating System supports two communications processing packages, the Communications Management System (CMS 1100) and the Processor Common Communication System (PCCS 1100), as well as the Distributed Communications Architecture (DCA).

The *Communications Management System* is the communications network interface for the 1100/80 system to a DCA-based DCP/Telcon network or to the General Communications Subsystem. It has been separated from the 1100 system generation process, thus allowing the entire terminal network configuration to be generated, checked, and corrected without generating a full system. CMS has cognizance of all terminals in an 1100 Series computer network. It acts as the communications "front-end" to the Transaction Interface Package (TIP), and handles polling, parity checking, data blocking, data packing and unpacking, message envelope formatting, message acknowledgement, message queuing, and other message control procedures. The message queue can be maintained in main and/or auxiliary storage; this common data pool is then accessed by the Transaction ▶

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▶ Interface Package. A Protocol function determines what the current activity on each circuit should be in terms of overall system loading, availability of facilities, user-specified priorities, type of circuit or device, and activity response level from the terminal.

CMS handles the standard Sperry Univac terminals as well as "alien" terminal devices. For alien devices the user must supply a skeletal communications control routine which interfaces into the device-control master service routine of CMS.

The *Processor Common Communication System* provides a means by which application programs developed in high-level languages such as Cobol and PL/1 can utilize the Series 1100 communications system. Programs using PCCS 1100 can communicate with other communication programs, terminal users, remote batch systems, and certain host computers.

The Distributed Communications Architecture (DCA) describes the currently-available communications hardware and software components through which networking of Univac processors and terminal devices is achieved.

Whether network control is host-dependent or host-independent, there are still certain hardware components and subsystems required to implement a DCA network. Inherently, a DCA node or host must contain several software components which provide it with the network interface. These components are detailed in this report.

The capability of completely separating communications management from applications processing is a key characteristic of DCA. The off-loading of communications processing permits the host, or hosts, to concentrate their energies on applications processing, their primary function.

In fact, in a DCA network, the host may (from a communications point of view) be required only to compile user programs for network management. Support programs would reside in the host for this purpose, and after compilation, object code would be loaded directly into channel-attached front ends or written to storage media for later loading into remote communications nodes. The host would then be free of communications and network control activities.

It is noteworthy that Sperry Univac offers an extensive library of modular network management applications. User programming for tailored communications functions (such as message switching) is also fully supported.

A feature which serves to distinguish DCA from the architectural offerings of other major vendors is the facile acceptance into the DCA environment of non-Univac terminals, processors and networks, and the flexible modularity of the existing Sperry Univac communications hardware and software.

A minimal DCA network requires a DCA host with a communications subsystem. The host may be either an 1100 mainframe running under the 1100 operating system, or a 90 Series CPU, Model 60 or 80, running the VS/9 operating system.

A DCA terminal is generally one for which a standard terminal handling module is available from Sperry Univac. In DCA, each terminal might be operating with different character codes (ASCII, EBCDIC), transmission modes (start/stop asynchronous, character synchronous), or terminal protocols (U100, IBM 2780). It is the responsibility of the DCP closest to the terminal to translate its data format into a common trunk language—typically UDLC.

UDLC is a bit-oriented, synchronous protocol designed for full-duplex operation. Devices connected by UDLC trunks can utilize either switched or non-switched, voice-grade or digital lines. UDLC, like its SDLC, HDLC and ADCCP predecessors, uses bit sequences for control codes rather than whole characters. (Hence the nomenclature "bit-oriented.") This characteristic permits much more control information to be contained in the same or smaller amount of message space.

DATA MANAGEMENT: The *Universal Data System* (UDS 1100) is a collection of programs designed to provide 1100 Series users with a single unified data subsystem that furnishes the data management services for all components of the 1100 Operating System. UDS 1100 components include the UDS 1100 Control, Data Management System (DMS 1100), Processor Common Input/Output System (PCIOS), Relational Data Management System (RDMS 1100), Data Dictionary System (DDS 1100), Define File Processor (DFP), Integrated Recovery Utility (IRU), and File Administration System (FAS).

The *UDS 1100 Control* is the on-line data manager of the UDS system, which provides a complete range of data structures, utility programs, and support programs. UDS 1100 Control integrates these different programs and manages the movement of data between data models. The control module allows file sharing through a locking mechanism and allows the same program to access several data models. It also centralizes functions such as audit trails and administration.

DMS 1100 is a comprehensive database management system developed under the guiding principles of the CODASYL Data Base Task Group. It is designed to satisfy the need for standardized data management techniques that provide: 1) separation of the data definition and data manipulation functions, 2) an acceptable degree of data independence, 3) database protection and integrity, and 4) alternate data access methods. DMS has four principal components: a Data Description Language, a Data Manipulation Language, a Data Management Routine, and a Data Recognition Utility.

The Data Description Language is a standalone language whose record descriptions are compatible with those of Cobol. The Data Manipulation Language consists of commands embedded in Cobol, Fortran, and PL/1 to allow these host languages to manipulate the database via DMS 1100. The Data Management Routine, the key operational component of DMS 1100, maintains the database and preserves its integrity. The Data Reorganization Utility provides for optimization of the physical placement of records within an existing database without the need for tailored unload and reload programs. (For further information on DMS 1100, please refer to Report 70E-877-02 in Volume 3.)

PCIOS is designed to assure compatible data file formats. It supports sequential, indexed sequential, and multi-keyed sequential access methods for APL, PL/1, ASCII Cobol, ASCII Fortran, RPG, Sort, and QLP.

RDMS 1100 provides definition and access for both host language programming and end-user interface software. Relational databases are defined by the data manipulation language used for retrieval and updating of data. The Relational Transformation Language provides relational views of other databases, such as DMS 1100.

DDS 1100 provides a means for the centralized description, location, and control of the various elements within a user database environment. DDS 1100 consists of a database of information, called the meta-database, about the entities in the user database environment, as well as a set of processors that access the meta-database for the purpose of creating, updating, and reporting information.   ▶

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▶ *The Define File Processor* provides a data file description external to the program processing the file. Using DFP, programs written in Fortran, Cobol, PL/1, APL, and RPG are file-format-independent and can share common files.

The *Integrated Recovery Utility* provides the user with English-language commands to initiate a variety of integrity features and capabilities. IRU can be used to control user access to selected TIP or TIP/DMS files or to provide partial file access. It can also be used to compare complete or partial records between files.

The *File Acquisition System* is a functional successor to Sperry Univac's file administration processor, SECURE. FAS provides extensive file handling and control within an Interactive Processing Facility system environment. FAS includes capabilities for mass storage file backup, archiving, and reporting. It also provides for the administration of hierarchical files and directories.

TRANSACTION PROCESSING: The following programs provide transaction processing capabilities for 1100 Series systems: The Transaction Interface Package (TIP), Information Management System (IMS 1100), and Display Processing System (DPS 1100).

TIP serves as the "middleman" between the 1100 Operating System and the user's application programs in a transaction-oriented on-line data processing system. TIP's functions are stimulated by the incoming transaction messages stored in the common data pool maintained by CMS. The TIP transaction scanner, TRANSCAN, analyzes each message, determines which application program is required to process it, and arranges for the Executive to load and execute that program. One application program can also call another application program via TIP, through program action based on data parameters. The application programs can be written in Cobol, Fortran, Assembly Language, or PL/1 and can be re-entrant. TIP's features include on-line debugging aids, a batch-mode checkout capability, interprogram protection facilities, and comprehensive system recovery provisions. User-written routines can be accommodated by TIP to perform installation-specified functions such as prioritizing messages and other special message manipulation.

IMS 1100 is an interactive transaction processing system compatible with the IMS 90 used on the Sperry Univac 90 Series computers. It provides defined record management and access to both data and conventional files.

DPS 1100 provides for screen handling and the management of display-oriented transactions in an on-line environment. The system operates in conjunction with the Transaction Interface Package or the Conversational Time-Sharing System. DPS 1100 includes an interactive screen generator and a screen handler. Additional functions are provided for data editing and validation, applying passwords to screens or separate fields of screens, and controlling access to multi-page screens.

END-USER SYSTEMS: The following software products are specifically designed for end users: Mapper 1100, Advanced Information Service (ADVISE 1100), Query Language Processor (QLP 1100), and Remote Processing System (RPS 1100).

Mapper 1100 is a real-time report processing system for multiple Uniscope 100/200 or UTS 400/4000 terminal systems. Data is collected and updated via the CRT display units in free-form or prescribed report formats. Functions such as record and page display, update, search, sort, and report generation can be developed into saved programs for on-line application development. A forms generation capability allows implementation of databases and related report processing and generating services without applications programming.

ADVISE 1100 provides a set of easy-to-use tools for data definition, data interaction, and application development. ADVISE 1100 furnishes the query, update, and application development interface to RDMS 1100, so that users can design and access relational databases.

QLP 1100 is an English-language inquiry system that allows inquiries to be made to databases generated under DMS 1100. QLP 1100 has the ability to access standard data files and incorporates extended reporting capabilities. It uses a command language designed around a simplified English syntax and requires a minimum knowledge of the DMS 1100 database structure. QLP can operate either in demand or batch mode, although the primary mode is interactive. Its two major component modules, the Scan Parser, which analyzes incoming commands, and the Task Translator, which accesses the database, are both re-entrant. Through the use of the QLP command languages, users can inquire into the database, update records, add new records, or delete records. QLP 1100 uses a Subschema Data Definition Language (QLPSDDL) that is similar to the DMS 1100 DDL. Access to the database via QLP is regulated by the Data Base Administrator through use of SDDL. QLP also provides a report writer and procedural facilities.

The *Remote Processing System* is an interactive data management and file processing system that provides access to system resources by a nonprogramming-oriented user interface through a Uniscope 100 or Uniscope 200 CRT display terminal. RPS 1100 database files are created and maintained under DMS 1100, and the system interfaces with TIP for transaction interfacing and control. RPS 1100 provides a set of generalized system functions which can be invoked by the user via the terminal. These include commands to ENTER, BUILD, DESTROY, or FORM a file; to process a file through SEARCH, MATCH, or SORT; to build an INDEX structure to line item data and data fields for faster access; to perform computations on specified fields; and to request printing of reports in user-specified formats. RPS 1100 provides tutorial assistance to end users by displaying a choice of functions for user selection and utilizing "fill in the blanks" techniques to permit users to enter commands.

INTERACTIVE PROCESSING: Several software programs are available for interactive processing, including the Conversational Time-Sharing System (CTS 1100), High-Volume Time-Sharing (HVTS), and Interactive Processing Facility (IPF).

CTS 1100 is a modular software system that provides users at remote terminals with an efficient human-machine interface. The system consists of the CTS Control module, interactive syntax analyzers for Basic, Fortran, Cobol; and access to the compilers for Basic, Fortran, Cobol, Algol, and APL. CTS provides the user with a simplified command language editor.

The design of CTS is particularly oriented toward facilitating the development and debugging of programs. CTS facilities enable users to: 1) enter and debug source programs in line-by-line fashion; 2) compile programs; 3) edit source programs and data; 4) collect and execute programs; 5) save programs and data; 6) retrieve saved programs and data; 7) create files; 8) access the DMS data base; 9) format the output of data; 10) scan files and produce selective printouts; 11) write interactive procedures in CTS control language; and 12) perform calculations in desk calculator mode.

CTS has effectively been superseded by the newer Interactive Processing Facility, which is described below. ▶

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▶ *HVTS* is an alternative to CTS that looks to the end user like a subset of CTS. It has the ability to handle 50 to 2000 active terminals concurrently. Each terminal can be active in one of six modes: APL, Basic, and Fortran language modes; a data mode; master mode; and monitor mode. A quota set regulates each terminal user, restricting use by time of day, maximum CPU usage, maximum program size, maximum data size, maximum program execution time, and language mode selection.

The *Interactive Processing Facility* supports both batch and time-sharing operations. It provides a user interface to the system through a procedural command language and an English-language response language. IPF 1100 is designed for ease of use by users with little or no data processing background as well as by computer professionals. Functional capabilities can be expanded by adding user-developed program modules or by modifying or adding commands. IPF 1100 includes data management capabilities, security features, and session control capabilities.

IPF consists of eight separately priced modules. The IPF Command Language is the primary interface for using IPF. It is based on CODASYL specifications. The development of command language subroutines and macros is accomplished through the use of the IPF Procedures module. The Distributed Data Processing module supports file transfers and job submissions from 1100 Series to 1100 Series systems. The Edit 1100 module is an input and update editor that provides access to a variety of file formats, works in an easy-to-use full-screen mode, and can be used from a terminal or called from a program. The User Assistance module manages both responses to the terminal user and HELP and explanation processing.

LANGUAGE PROCESSORS: The 1100 Series computers support a number of programming languages, which are described in the following paragraphs.

The *ASCII Cobol* compiler implements the modules of the 1974 American National Standard Cobol. Numerous extensions are also included. The ASCII Cobol compiler is re-entrant and produces re-entrant code.

ASCII Cobol recognizes ASCII characters as the standard data code at both source and object time, with 6-bit Fieldata character code handling facilities available as an option. In addition to the character modes, binary and floating-point data forms are supported. Some of the 1974 American National Standard Cobol facilities implemented include: Debugging, Report Writer, Communications (via TIP or Message Control System), and the INSPECT, STRING, and UNSTRING verbs. Principal language extensions based on CODASYL development efforts include: database management (via DMS), interprogram communication, and asynchronous processing. Additional nonstandard extensions include: debugging features (including MONITOR and EXHIBIT), a TRANSFORM verb to develop one character string from another, expanded forms control facilities including 160-character print line and variable print density control, indexed sequential file handling including generic START and conditional START facilities, and numerous compatibility features for upgrading from earlier 1100 Cobols or other vendors' Cobols.

Sperry Univac also offers a conversational Cobol Processor (BCOB) that permits time-sharing users to construct, edit, and debug Cobol programs from demand terminals. BCOB executes as a full re-entrant submodule of the Conversational Time-Sharing System (CTS) and supports the full CRT command set. Its syntax analysis facilities are compatible with both ASCII Cobol and an earlier Fieldata Cobol compiler. Syntax analysis is performed either statement-by-statement as the program is entered from the terminal or in blocks as the program is called from the file system.

ASCII Fortran is a re-entrant Fortran compiler that handles ASCII data codes and contains useful extensions for the manipulation of both numeric and non-numeric data. The ASCII Fortran language is an extension of the previous Sperry Univac Fortran V language and implements the Fortran 77 Standard. It contains features specified by the standard as well as many language extensions, including the following ASCII extensions. A CHARACTER type statement allows handling of character variables, character scalars, and character arrays. A set of character operations is provided, including concatenation of strings, relational comparisons of strings, character-valued functions, and a string function that permits character variables to be extracted from or assigned to substrings of character variables. ASCII Fortran provides the double-precision complex data type, in which complex numbers are represented internally as a pair of double-precision floating-point numbers. This data type supports a precision of approximately 17 significant decimal digits and an exponent range of 10^{-308} to 10^{308} for both real and imaginary components of a complex number. ASCII Fortran also expands the use of expressions by permitting expressions to be used in positions that previously (in Fortran V only) allowed simple variables or array elements.

ASCII Fortran is a four-pass, re-entrant, common-banked compiler that provides for extensive optimization, generates re-entrant programs, and contains facilities designed to fully utilize 1100 Series hardware features and the operating system. Some of the features are I/O data format compatibility, interlanguage communication with Cobol and PL/1, sort/merge capability, and an interface with DMS 1100. In addition, the ASCII Fortran compiler contains a checkout option that provides for direct execution of Fortran programs and subroutines, with interactive debugging also provided.

Sperry Univac also offers a re-entrant ASCII Fortran Syntax Analyzer (BFTN), which is used in conjunction with the Conversational Time-Sharing software. BFTN aids the time-sharing user in constructing, editing, and debugging the syntax of ASCII Fortran programs from a demand terminal.

APL 1100 is a re-entrant, interpretive processor that uses 9-bit ASCII code and functions as part of the Conversational Time-Sharing System. APL 1100 provides a superset of the ad hoc industry-standard APL language. It provides all the language features of the Iverson notation and offers extended capabilities in the areas of I/O operations and operating system related functions.

Pascal 1100 is based on the specifications of the American National Standard X3J9. Pascal 1100 facilitates the use of structured programming techniques for general programming problems through the use of the following control constructs: IF-THEN-ELSE, WHILE-DO, REPEAT-UNTIL, FOR-DO, and CASE. Pascal 1100 also includes data structuring facilities such as arrays, record structures, and file structures.

Sperry Univac's *NU Algol* language is based upon Algol 60, extended through the provision of input/output logic, facilities for complex and double-precision arithmetic, and the ability to name strings. Procedures written in Fortran V or Assembler language can be included. The Algol compiler runs under 1100 Operating System control.

Sperry Univac's *Basic compiler* is an interactive processor that accepts source-language statements from remote users, checks their syntax, and issues diagnostics immediately whenever it detects an error. After the whole program has been checked, a RUN command causes it to be compiled and executed. A file controller package permits manipulation of saved program files, and re-entrant capability enables multiple time-sharing terminals to use the compiler ▶

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➤ simultaneously. The system need not be dedicated exclusively to Basic operations.

The *1100 Series PL/1* compiler is Sperry Univac's implementation of the multipurpose programming language which has been proposed for standardization by ANSI and the European Computer Manufacturers Association (ECMA). Compilations can be performed with or without optimization. An extensive library of re-entrant run-time support routines complements the re-entrant code generated by the compiler with arithmetic computations, service subroutines such as input/output functions, dynamic program and storage management, and error and interrupt processing.

The *1100 Series RPG* is upward-compatible with Sperry Univac Series 70 RPG. It supports sequential, indexed sequential, and table files and provides common report-writing features such as input data selection, editing, calculation, multiple report files, summarizing, control breaks, and file updating. During program generation, storage areas are automatically assigned, constant factors are included, and linkages are produced to routines for input/output operations and calculations. Indexed sequential files are processed through an interface with the Index Sequential File Management System (ISFMS).

The *RPG II Group* is a software package that includes an RPG II compiler, auto report feature, and RPG II editor. The compiler is compatible with the Sperry Univac VS/9 and OS/3 operating systems used on the Series 90 computers.

MACRO is a general-purpose processor for extending host languages through its ability to process character strings. MACRO performs text generation, editing, and validation.

The 1100 Series *Meta-Assembler (MASM)* is capable of generating code for any binary machine, but is tailored to be especially efficient for the 1100 Series instruction set. MASM provides all the conventional features of an assembler: code and data generation, symbol definition, space definition, and external communication with separately constructed elements.

In addition to the language processors described above, Sperry Univac also offers the *Programmers Advanced Debugging System* (PADS 1100), a language-independent debugging tool. PADS was designed primarily for debugging programs written in high-level languages such as Cobol, Fortran, and PL/1, but it may also be used for programs written in Assembler.

UTILITIES: The 1100 Operating System supports a number of utility packages, including CULL, Sort/Merge, Log Analyzer, Performance Analysis Routines, and the On-Line System Activity Monitor.

CULL produces an alphabetically sorted, cross-referenced listing of all symbols in a specified set of symbolic elements. Each symbol processed by CULL can contain up to 12 alphanumeric characters plus the dollar sign. An interactive version, IACULL, is also available.

The *Sort/Merge* package provides three sort options and a standard merge option. The sort options are record sort, selection sort, and tag sort. Up to 26 files can be merged, and up to 40 keys can be specified.

The *Log Analyzer* (LA) is designed to assist the user in monitoring the resource utilization of an 1100 Series system. The *Performance Analysis Routines* (PAR) package is a reporting system for data collected by the Software Instrumentation Package embedded in the operating system. The *On-Line System Activity Monitor* (OSAM) provides an on-line, real-time display of system activity. OSAM can be used in conjunction with LA and PAR.

APPLICATION PROGRAMS: The 1100 series application packages currently available from Sperry Univac include:

APT (Automatically Programmed Tools)
ASET (Author System for Education and Training)
FMPS (Functional Mathematical Programming System)
GIFTS (Graphics-Oriented Interactive Finite-Element Time-Sharing System)
ICES (Integrated Civil Engineering System)
OPTIMA 1100 (Project Management System)
SUFICS 1100 (Sperry Univac Financial Integrated Control System)
UNIDAS 1100 (Information Storage and Retrieval)
UNIFACS 1100 (Univac Financial Systems)
UNIS 1100 (Univac Industrial Systems); includes Bill of Materials Processor, Inventory Control, and Planning and Scheduling
VAST (Vector and Array Syntax Translator)

PRICING

The 1100/80 is available for purchase or on a one-year or five-year lease. All software except the operating system is unbundled. On-site service for operating system support can be obtained for a flat monthly fee. Sperry Univac also offers a 7-year lease to state and local governments and to educational institutions. Educational institutions are eligible for an additional 10 percent discount. The discount does not apply to maintenance service charges.

CONTRACT TERMS: The standard Sperry 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 between the hours of 7 a.m. and 6 p.m., Monday through Friday. Extended periods of maintenance are available at premium rates. The premiums for additional coverage are a percentage of the base maintenance rate and are as follows:

Hours of Coverage

	4	8	9	10	12	16	18	20	24
Monday through Friday	—	—	100	105	110	115	120	125	130
Saturday	5	8	9	—	11	12	—	14	15
Sunday and Holidays	7	10	12	—	14	16	—	18	20

Maintenance service performed outside the contracted maintenance period is subject to the following rates:

	Monday through Friday	Saturday, Sunday and Holidays
Min. charge per call	$264	$300
Each addl. hour	132	150

Users who elect not to contract for maintenance with Sperry Univac pay the same rates on a per call basis.

TRACE: Sperry Univac has initiated a remote hardware maintenance concept through its facility in Roseville, Minnesota. The Total Remote Assistance Center (TRACE) is available to 1100/80 system customers via a dedicated WATS number 24 hours per day and seven days per week. Via TRACE, a user's system may be monitored and controlled using on-site and remote library testing programs. TRACE ➤

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also provides support for a wide range of Sperry Univac terminals connected to dial up lines. Various data files in Roseville contain information on approved hardware changes, references to solutions for problems encountered with diagnostic test software in field use, and operating system enhancements and problems. Other files contain a history of how the system should operate properly, and can be utilized for comparison purposes during diagnostic testing.

EQUIPMENT: The following systems illustrate two 1100/80 configurations. All necessary control units and features are included in the indicated prices, but software is not included. Quoted lease prices do not include maintenance charges.

1100/81 SYSTEM: Consists of an 1100/81 processor (3032-65) with 8K words of buffer storage; 2048K words of main storage; IOU with one block multiplexer channel, one byte multiplexer channel, and four word channels; four 8470 Disk Units (360 million words) and associated controller; eight Uniservo 24 Magnetic Tape Units and associated controller; one 0716 Card Reader, and two 2000-lpm 0770 Printers. Purchase price is $2,930,787 and monthly rental on a one-year lease is $80,356.

1100/84 MULTIPROCESSOR SYSTEM: Consists of an 1100/84 system (3032-25) with four central processors; 32K words of buffer storage; 8192K words of main storage; four IOUs with four block multiplexer channels, four byte multiplexer channels, and 16 word channels; three 8480 Disk Units (1.08 billion words) and associated controller; 16 Uniservo 32 Magnetic Tape Units and associated Controller; one 0716 Card Reader; and two 2000-lpm 0770 Printers. Purchase price is $8,597,611 and monthly rental on a one-year lease is $225,872.

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*
PROCESSORS AND I/O CONTROL				
3032-67	1100/80 Processor; includes full 1100 floating-point and byte instruction set, one I/O process-ing unit (IOU) with one byte and one block multiplexer channel, one word channel module, 4K words of buffer storage in one buffer module, 512K words of backing store in one cabinet, system maintenance unit, transition unit, system console, and motor alternator; expandable to 1024K words of backing store; any further expansion requires addition of F2335-99 performance enhancement, or must be expanded as a standard 1100/81 processor	1,389,628	3,490	35,431
3032-65	1100/81 Processor; includes same equipment as 3032-67 except provides space for an addi-tional channel module and includes 8K words of buffer storage in one module; expandable to four processors, four IOUs, 32K words of buffer storage, and 8192K words of backing store	1,554,557	3,712	39,647
3032-63	1100/82 Multiprocessor; includes two processors in a tightly coupled configuration with 8K words of buffer storage and 1024K words of backing store in two cabinets, one IOU, a system maintenance unit, a transition unit, a system console, and a motor alternator	2,414,475	5,832	60,129
3032-61	Same as 3032-63 but backing store is in one cabinet	2,293,736	5,543	57,123
3032-29	1100/82 Dual Cluster Multiprocessor; includes two processors each with 12K words of buffer storage, a system maintenance unit, motor alternator, IOU, and system console. Each IOU contains one byte multiplexer, one block multiplexer, and one word channel module; includes 1536K words of backing store in three cabinets	3,617,644	8,615	89,924
3032-27	1100/83 Cluster Multiprocessor; same as 3032-29 but three processors in two clusters	4,242,872	10,085	105,609
3032-25	1100/84 Cluster Multiprocessor; same as 3032-29 but four processors in two clusters; each cluster has 16K words of buffer storage; includes 2048K words of backing store in four cabinets	5,414,871	12,651	134,791
	Features for 3032 Processors:			
3022-53	Processor Expansion; provides a second processing unit; requires 8K words of buffer storage and 1024K words of backing store	641,256	1,399	15,974
3032-89	Cluster Expansion for 1100/81 single cluster processor; includes one CPU, 8K words of buffer storage, one system maintenance unit (SMU)	823,946	1,772	20,374
F2335-99	Performance Enhancement; upgrades a 3032-67 or 3022-43 processor to a standard 1100/81 processor with 8K words of buffer storage	182,721	213	8,336
3033-98	IOU Expansion; provides an additional IOU; includes system console	368,366	988	8,951
K2883-00	Scientific Accelerator Module (SAM)	130,447	240	3,252
F1653-00	Emulator for 494; requires 494 word channel module and/or 494 block multiplexer channel; mutually exclusive with F2883-00 and 3022 processors	187,425	404	4,669
3022-43	1100/80S Processor; same as 3032-67 but includes Scientific Accelerator Module; may be expanded as a standard 1100/81 with SAM	1,447,690	3,740	36,841
3022-97	1100/81 Processor; same as 3032-65 but includes Scientific Accelerator Module	1,685,003	3,965	42,897
3022-95	1100/82 Multiprocessor; same as 3032-63 but includes Scientific Accelerator Module	2,675,369	6,334	66,632
3022-93	1100/82 Multiprocessor; same as 3032-61 but includes Scientific Accelerator Module	2,554,629	6,047	63,626
3022-91	1100/82 Dual Cluster Multiprocessor; same as 3032-29 but includes Scientific Accelerator Module	3,878,537	9,117	96,426
3022-89	1100/83 Multiprocessor; same as 3032-27 but includes Scientific Accelerator Module	4,634,212	10,840	115,362
3022-87	1100/84 Multiprocessor; same as 3032-25 but includes Scientific Accelerator Module	5,936,658	13,659	147,796

*Rental prices do not include maintenance.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*
► PROCESSORS AND I/O CONTROL (Continued)				
	Features for 3022-43 and 3022-9X Processors:			
3022-52	Processor Expansion; provides a second processing unit with a Scientific Accelerator Module; requires 8K words of buffer storage and 1024K words of backing store	771,703	1,650	19,225
3022-51	Cluster Expansion; expands a standard 1100/81 single cluster to two clusters; includes processor with SAM, 8K words of buffer storage, and a system maintenance unit	954,392	2,024	23,625
3022-49	1100/81 Processor; includes Scientific Accelerator Module, standard 1100 instruction set, one IOU space for one additional channel module, 8K words of buffer storage in one module, 1024K words of backing store in two cabinets, a system maintenance unit, a transition unit, a system console, and a motor alternator; supports Array Processor Subsystem; expandable to up to four processors, two Array Processor Subsystems, four IOUs, 32K words of buffer storage, and 8192K words of backing store	2,079,194	4,868	54,235
3022-48	1100/82 Multiprocessor; same as 3022-49 but includes two processors; expandable by addition of Array Processor Subsystems	2,753,069	6,518	71,716
3022-47	1100/82 Dual Cluster Multiprocessor; includes two processors in two clusters; same equipment as 3022-48 but includes 16K words of buffer storage in each cluster and 2048K words of backing store in four cabinets	4,607,353	10,277	119,526
3022-46	1100/83 Multiprocessor; same as 3022-47 but includes three processors in two clusters	5,361,977	12,002	139,198
3022-45	1100/84 Multiprocessor; same as 3022-47 but includes four processors in two clusters	6,128,808	14,099	159,738
	Features for 3022-49 through 3022-45 Processors:			
3022-44	Cluster Expansion; expands a 3022-49 or 3022-48 to two clusters; includes a processor with SAM, 16K words of buffer storage, and a system maintenance unit	1,212,808	2,507	31,049
3063-99	Array Processor Subsystem; includes array processor control unit and array processor unit with 8K words of instruction memory and 64K words of data scratchpad memory, maximum of one per system	997,500	3,734	43,202
3063-98	Second Array Processor Subsystem; maximum of one may be added to dual cluster systems, 3022-47 through 3022-45; requires 3063-99	997,500	3,734	43,202
	Features for all 1100/80 Series Processors:			
1923-00	I/O Channel Expansion; includes housing for four additional channel modules	11,067	22	277
F1656-00	Byte Multiplexer Channel Module; transfer rate up to 200 KBS	49,061	108	1,230
F1657-00	494 Block Multiplexer Channel Module; transfer rate up to 1.0 MBS	49,061	108	1,230
F1658-00	494 Word Channel Module; transfer rate up to 500K words per second	56,779	122	1,413
F1658-01	1100 Word Channel Module; four independent word channels	56,779	122	1,413
F1654-00	1100 Word Channel Definition; provides word channel capability to accept 36-bit ESI communications; requires F1658-01	1,103	5	27
F2141-00	1100 Block Multiplexer Channel Module; transfer rate up to 1.5 MBS	56,779	122	1,413
4013-97	System Console	83,815	478	1,842
0786-37	Console Printer; 200 cps; bidirectional	7,222	68	204
8508-08	Motor Alternator	23,100	72	690
F3137-00	Remote Control Panel	1,071	3	27
2521-02	Channel Transfer Switch for block multiplexer channels; free-standing cabinet contains operator controls for manual switching of four subsystem strings, a primary module with a 2 x 1 switch, and power and space for 4 x 8 switching	19,781	74	466
F2600-00	Primary Module Expansion; adds a switch for one subsystem string; maximum of three per 2521, or F2601-02; maximum of one per F2601-03	586	0	14
F2601-02	Additional Primary Module; adds a second 2 x 1 primary module and operator control for switching up to four subsystem strings	10,476	40	260
F2601-03	Secondary Module; for applications requiring independent 2 by switching capability when up to four switchable strings can be configured among independent 2 by switches	10,476	40	260
F2602-01	Secondary Module; expands primary module from 2 x 1 to 4 x 1	7,127	31	176
F2603-00	Secondary Module; expands F2602-01 by one subsystem string	586	0	14
F2604-00	DC Power Redundancy; adds back up DC supplies for hot standby dynamic power redundancy	2,680	12	66
MEMORY				
F2336-00	Buffer Storage; provides 4K words of buffer storage to expand single cluster systems from 8K to 12K words	218,558	476	6,270
F2335-00	Buffer Storage; provides 4K words of buffer storage to expand single cluster systems from 12K to 16K words	102,958	224	2,958
7037-99	Backing Store; includes storage cabinet with 512K words in two banks and power supplies	330,750	720	9,499
F2350-99	Backing Store Expansion; expands 7037-99 storage unit to 1024K words; also expands the backing store included in the 3032-67, 3032-65, and 3022-43 processors	210,000	433	6,026
F2350-98	Backing Store Expansion; expands backing store from 4096K to 6144K words or from 6144K to 8192K words; not available for 3022-49 through 3022-44 processors	630,000	1,012	18,078
F2336-99	Buffer Storage, 8K; expands buffer storage of single cluster Array Processing Systems from 8K to 16K words	347,765	690	8,690
7050-99	Backing Store; includes two storage cabinets each with 512K words in two banks and power supplies; for use on 3022-49 through 3022-44 only; requires F2336-99	707,700	1,550	17,741

*Rental prices do not include maintenance.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*
► MEMORY (Continued)				
F2913-99	Backing Store Expansion; expands 7050-99 storage unit or processor backing store by 1024K words; for use on 3022-49 through 3022-44 only	448,875	930	11,260
F3570-00	Instruction Memory Expansion; provides additional 8K words of instruction memory for Array Processor Subsystem; maximum of one expansion per Array Processing unit	149,100	297	6,425
F3571-00	Data Store Expansion; provides additional 64K words of data scratchpad memory for Array Processor Subsystem; maximum of three expansions per Array Processing unit	149,100	297	6,425
MASS STORAGE				
8407-00	Diskette Subsystem; includes controller and auto-load diskette drive; 20 megabytes	22,000	150	514
8407-02	Diskette Expansion; provides additional diskette drive	6,000	40	172
F3470-00	Translate Table; provides 512 bytes of storage for character translation	3,640	17	104
5012-99	FH-432/FH-1782 Drum Control; controls one to eight 6016-00 or 6015-00 drums in any combination	102,720	509	2,247
F0929-00	Write Lockout Feature for 5012-99 drum control	1,392	5	32
F0930-99	Shared Peripheral Interface for 5012-99 drum control; for MSA applications	22,608	48	495
6016-00	FH-432 Drum; 256K words	52,848	210	1,271
6015-00	FH-1782 Drum; 2048K words	146,064	585	3,512
F0786-01	Dual Channel Feature for 6016-00 drum	3,024	28	72
F0767-00	Dual Channel Feature for 6015-00 drum	3,024	32	69
5039-91	8433/8430 Control for up to eight 8433 and/or 8430 disk drives; minimum two disk drives per subsystem	54,000	374	1,971
F2046-00	Dual Channel Feature	3,460	21	97
F2047-00	16-Drive Expansion; provides the capability to attach up to 16 8433 and/or 8430 disk drives to a 5039-91 control	5,760	51	211
8430-99	8430 Disk Storage; provides a single 8430 disk drive; minimum two required	18,720	162	684
F2342-00	Disk Drive Upgrade; converts an 8430-99 to an 8433-00	8,640	75	313
8433-00	8433 Disk Storage; provides a single 8433 disk drive; minimum two required	27,360	237	997
F2021-00	8433/8430 Dual Access; provides simultaneous read/read, read/write, write/read, write/write operation on any two 8433-00 or 8430-99 disk drives; required in each 8433-00 and 8430-99 disk drive in the subsystem; requires two 5039 controls	1,630	5	59
F1230-00	Disk Pack; provides up to 100 million bytes or 17 million 36-bit words of removable storage	1,440	0	53
F1223-00	Disk Pack; provides up to 200 million bytes or 34 million 36-bit words of removable storage	1,820	0	66
5046-99	8430/8433/8434 Control; controls up to 16 8430, 8433, and/or 8434 disk drives; maximum 866 megabytes of storage; requires minimum of two disk drives	102,000	509	3,156
5046-97	8430/8433/8434 Dual Control; for dual-access subsystem operation; requires two channels	176,448	889	5,714
8434-99	8434 Disk Storage; provides two single-spindle disk drives with non-removable pack	66,600	288	2,439
F2561-00	32-Device Capability; allows up to 32 8430, 8433, or 8434 disk drives to be intermixed on one 5046-99 control; two required for 5046-97 dual control	7,680	51	211
F2021-99	8434 Dual Access; provides simultaneous read/write, read/read, write/read, and write/write on any two 8434 disk drives; requires 5046-97 dual control or two 5046-99 controls	2,688	17	64
5046-95	8430/8433/8450 Control; controls up to 16 8450 disk drives and power for up to four sets of four drives of any type (i.e., 8430/8433 or 8450); requires minimum of two disk drives	102,000	509	3,077
5046-93	8430/8433/8450 Dual Control; two control units, each with the same characteristics and restrictions as the 5046-95 control; requires two F2838-00 8450 capability expansions or two F2720-00 8430/8433 capability expansions	176,448	889	5,417
F2838-00	8450 Capability Expansion; allows 5046-95 control to handle up to 32 8450 disk drives, requires 2837-00 power control expansion (excludes use of F2720-00 8430/8433 capability)	6,000	57	171
F2720-00	8430/8433 Capability Expansion; allows 5046-95 control to handle up to 16 8430 and/or 8433 disk drives (excludes use of F2838-00 8450 capability)	2,400	12	68
F2837-00	Power Control Expansion; required when total number of disk drives exceeds 16; two required for 5046-93 dual control	7,680	51	211
8450-99	8450 Disk Storage; provides two 8450 disk drives using non-interchangeable data modules included as part of each drive; 54M words of storage per drive	66,600	317	2,439
8450-97	8450 Disk Storage; provides two 8450 disk drives using non-interchangeable data modules with fixed and movable heads	74,600	350	2,723
F2717-99	8450 Fixed-Head Conversion; converts 8450-99 disk storage unit to an 8450-97 disk storage unit	13,600	31	285
F2718-99	8450 Dual Access Feature; provides dual access and simultaneous read/write, read/read, write/read, and write/write on any two 8450 disk drives; requires two 5046 controls	2,688	17	64
5056-99	8470 Disk Subsystem; includes one 8470 disk drive and 5056-83 controller for up to eight 8470 drives	87,200	327	2,473
5056-97	8470 Disk Subsystem; same as 5056-99, but includes fixed-head capability with 338,688 words of additional capacity	94,000	349	2,615
5056-95	8470 Disk Subsystem; includes two 8470 disk drives and two controllers, each capable of supporting up to eight drives	162,000	610	4,594
5056-93	8470 Disk Subsystem; same as 5056-95, but includes fixed-head capability	175,600	654	4,877
5056-91	8470 Disk Subsystem; same as 5056-95, but with four drives	224,000	844	6,353
5056-89	8470 Disk Subsystem; same as 5056-91, but includes fixed-head capability	251,200	931	6,920

*Rental prices do not include maintenance.

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Sperry Univac 1100/80 System

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*

▶ MASS STORAGE (Continued)

		Purchase Price	Monthly Maint.	Rental (1-year lease)*
5056-87	8470 Disk Subsystem; same as 5056-95, but with eight drives	328,600	1,310	9,314
5056-85	8470 Disk Subsystem; same as 5056-87, but includes fixed-head capability	383,000	1,485	10,448
5056-83	8470 Disk Control; interfaces up to two word channels	102,000	467	2,835
F2994-00	Four Channel Capability for 5056-83	8,090	34	179
F3192-00	8430/8433 Attachment; allows up to eight 8430/8433 drives on 5056-83; up to three per controller are allowed	9,840	53	290
F3192-01	8450 Attachment; allows up to eight 8450 drives on 5056-83 controller; up to three per controller are allowed	11,680	53	290
F3192-02	8470 Attachment; allows up to eight additional 8470 drives on 5056-83 controller; up to three per controller are allowed	4,000	19	100
F3193-00	Controller Enhancement for up to 32 drives; required when over 16 drives are configured	1,600	4	36
F2837-00	Power Control Expansion; required when over 16 drives are configured	7,680	51	211
8470-99	8470 Disk Drive; 90M words of storage	33,600	120	992
8470-97	8470 Disk Drive; same as 8470-99, but includes fixed-head capability with 338,688 words of additional capacity	38,400	144	1,134
F2717-03	Fixed-head Conversion; converts 8470-99 to 8470-97	6,800	24	150
F2718-00	Dual-Access Feature; provides dual access and simultaneous read/write, read/read, write/read, and write/write; requires two controls	2,688	16	56
5056-73	8480 Disk Subsystem; includes two dual-access control units and two 8480 disk units; supports up to eight 8480 units; a maximum of three attachment features may be added; all drives must have dual access	310,890	1,310	7,773
F2994-99	Four-Channel Capability; provides additional channel interfaces; maximum of one per subsystem	16,180	68	358
F3192-99	8430/8433 Attachment; allows up to eight 8430/8433 drives on 5056-73 control	19,680	106	580
F3192-98	8450 Attachment; allows up to eight 8450 drives on 5056-73 control	23,360	106	580
F3192-97	8470/8480 Attachment; allows up to eight 8470 or two additional 8480 drives on 5056-73 control	8,000	38	200
F2837-99	Control Power Expansion; required when total number of drives exceeds 16	15,360	102	390
8480-99	8480 Disk Storage Unit; contains 4 spindles with a total capacity of 360M words; includes dual-access feature	92,240	456	2,212
8480-97	8480 Disk Storage Unit; same as 8480-99, but without dual access	84,240	436	2,040
F2718-02	8480 Dual-Access Feature; provides dual access and simultaneous read/write, read/read, write/read, and write/write	8,000	20	172
5057-99	Cache/Disk Processor; manages up to four 7053 cache storage units plus up to eight 8450 and eight 8470 or 8480 disk units (16 drives maximum)	104,700	355	2,795
7053-97	First Cache Storage Unit; 917,504 words of RAM; requires Segment Descriptor Table to operate in Cache/Disk mode; can be expanded to 3 million words via K3351-00	137,534	430	3,475
7053-96	Cache Storage Expansion Unit; 917,504 words; can be expanded to 3 million words via K3351-00	137,534	430	3,475
K3351-00	Cache Storage Expansion; provides additional 917,504 words of storage to 7053-96 or 7053-97; maximum of 3 per 7053	89,000	170	2,200
F3117-00	Segment Descriptor Table; 16K words of storage; required when 7053 is used in Cache/Disk mode	7,584	25	237
F3117-01	Segment Descriptor Table Expansion; provides additional 48K words; required when cache memory exceeds 917,504 words; F3117-00 is prerequisite	12,816	45	400
F3117-02	Segment Descriptor Table; 64K words of storage; used when 7053 is used in Cache/Disk mode and has more than 917,504 words of storage; mutually exclusive with F3117-00 and -01	20,400	70	637
F3118-00	Dual Access Feature for 7053-97; requires two 5057 processors	4,416	15	138
F3118-01	Dual Access Feature for 7053-96; requires two 5057 processors	4,416	15	138
F3567-00	8450 Capability Expansion; permits sixteen 8450 disk units on cache/disk system; precludes use of 8470 disks	11,680	50	276
F3568-00	8470/8480 Capability Expansion; permits sixteen 8470 or four 8480 disk units on cache/disk system; precludes use of 8450 disks	11,680	50	276
F2994-00	Four-Channel Capability; expands channel interface capability to a total of four word channels	8,090	34	179

MAGNETIC TAPE UNITS

		Purchase Price	Monthly Maint.	Rental (1-year lease)*
5045-93	Uniservo 14 Control; consists of a control and cabinet with space for two Uniservo 14 tape units Controls up to eight 9-track phase-encoded tape units. Additional Uniservo 14 tape units are housed in the 5045-02 auxiliary cabinet. Up to three auxiliary units may be attached	29,453	183	706
5045-02	Uniservo Auxiliary Cabinet; consists of a Uniservo control cabinet with power distribution and space to mount one or two Uniservo 14 Tape Units	1,348	5	32
F0823-95	7-Track NRZI capability for 5045-93 control; includes ASCII to BCD translation and data conversion	5,990	31	144
F0823-94	Same as F0823-95 except that translation is Fieldata to BCD	5,990	31	144
F0823-93	Same as F0823-95 except that translation is ASCII to Fieldata	5,990	31	144
F0826-01	9-Track NRZI capability for 5045 control	5,990	31	144
F2627-00	9-Track Translation; provides the ability to translate data to and from 9-track tape units	2,064	14	52
F2627-01	Second 9-Track Translation feature	2,064	14	52
F1028-90	7-Track Addition; adds 7-track NRZI with ASCII/BCD translation and data conversion to F0826-01	4,343	14	104
F1028-89	Same as F1028-90 except that translation is Fieldata to BCD	4,343	14	104
F1028-18	9-Track Addition; adds 9-track NRZI to F0823-95, -94, or -93, one of which is prerequisite	4,343	14	104

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Sperry Univac 1100/80 System

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*
MAGNETIC TAPE UNITS (Continued)				
F0825-00	Dual Channel Capability	4,593	31	110
0870-03	Uniservo 14; 9-track phase-encoded tape unit; 96 KB per second at 1600 bpi	15,475	110	372
0870-04	Uniservo 14; 9-track phase-encoded and NRZI tape unit; 96 KB per second at 1600 bpi and 48 KB at 800 bpi	16,723	120	401
0870-05	Uniservo 14; 7-track NRZI tape unit; 48/33.4/12 KB per second at 800/556/200 bpi	15,475	110	372
F2194-00	U14 Dual Density; adds 9-track NRZI to a Uniservo 14 phase-encoded tape unit Type 0870-03	1,248	7	29
F2194-02	U14 7 to 9 Conversion; converts a Type 0870-05 Uniservo 14 7-track NRZI tape unit into a 9-track phase-encoded unit	0	0	0
F2194-03	U14 7 to 9 Dual Density; converts a Type 0870-05 Uniservo 14 7-track NRZI tape unit into a 9-track phase-encoded and NRZI unit; requires F0826-01 or equivalent in the control	1,248	7	29
5017-00	Uniservo 16 Magnetic Tape Control; up to sixteen 9-track, 1600-bpi non-simultaneous Uniservo 16 Tape Units	28,560	205	726
F0899-99	Simultaneous Operation for 5017-00 control; permits simultaneous read/read, read/write, write/read, and write/write on any two Uniservo 16 drives with dual access feature F1319-00	21,312	131	543
F0825-00	Dual Channel Capability; permits non-simultaneous operation on two block multiplexer channels; if F0899-99 is present, two F0825-00 features are required	4,593	31	110
F0823-99	7-Track NRZI 800 bpi capability for 5017-00; includes data conversion	5,990	31	144
F0823-96	7-Track NRZI; includes data conversion and BCD/EBCDIC translation	5,990	31	144
F0826-00	9-Track NRZI Capability for 5017-00	5,990	31	144
F1028-96	Adds 9-track NRZI to F0823-99 or F0823-96	4,176	19	96
F1028-95	Adds 7-track NRZI and Data Conversion to F0826-00	4,176	19	96
0862-04	Uniservo 16 Tape Unit; 9-track, PE, 1600 bpi, 120 ips	22,032	213	559
0862-06	Uniservo 16 Tape Unit; 7-track, NRZI, 200/556/800 bpi, 120 ips	22,032	213	559
F0937-01	Dual Density Feature for the 0862-04; adds 9-track, 800 bpi	2,448	0	54
F1319-00	Dual Access Feature; requires 5017-00 control and F0899-99 simultaneous operation feature	2,448	16	54
5058-00	Uniservo 22 Subsystem; includes two Uniservo 22 tape drives and control for up to eight Uniservo 22 or Uniservo 24 drives	75,840	377	2,129
5058-02	Uniservo 22 Magnetic Tape Drive; includes two dual-density PE/NRZI drives; 1600/800 bpi, 9-track, 75 ips	47,040	245	1,320
5058-06	Uniservo 24 Subsystem; includes two Uniservo 24 tape drives and control for up to eight Uniservo 24 or Uniservo 22 drives	83,520	417	2,349
5058-08	Uniservo 24 Magnetic Tape Drives; includes two dual-density PE/NRZI drives; 1600/800 bpi, 9-track, 125 ips	54,720	285	1,540
F0825-00	Dial Channel Feature; provides non-simultaneous operation on two channels of one processor or one channel on each of two processors	4,593	31	110
F2627-00	Translation Feature; translation is ASCII/EBCDIC, Fieldata/EBCDIC, or Fieldata/ASCII	2,064	14	52
F2627-01	Second Translation Feature	2,064	14	52
5042-00	Uniservo 30 Control for up to eight 9-track, dual-density (GCR/PE) Uniservo 30, 32, 34, and/or 36 drives	48,143	366	1,290
F2131-00	Adds 9-track NRZI to 5042-00; prerequisite for use of Uniservo 30 drives and all 7-track NRZI features	3,171	24	84
F2585-00	Translation Feature for 9-track drives on 5042 control; translation is in both directions involving, ASCII/EBCDIC, Fieldata/EBCDIC, and Fieldata/ASCII	1,785	14	47
F2585-01	Second 9-track Translator; F2585-00 required	1,785	14	47
F2584-99	Adds 7-track NRZI to 5042-00; includes ASCII to BCD translator and data conversion	1,617	12	42
F2584-98	Translator is ASCII to Fieldata	1,617	12	42
F2584-97	Translator is Fieldata to BCD	1,617	12	42
F2135-00	Dual Channel Feature for the 5042-00; provides non-simultaneous access to the control from two block multiplexer channels; not software supported	5,229	40	138
F2137-00	Drive Expansion Feature for the 5042-00; provides for up to 16 Uniservo 30, 32, 34, and/or 36 drives to be attached to the 5042-00	835	5	22
0872-00	Uniservo 30 Magnetic Tape Drive; 9-track, dual density PE/NRZI, 1600/800 bpi, 200 ips	30,335	230	860
0872-02	Uniservo 30 Magnetic Tape Drive; 7-track, NRZI, 800/556, 200 bpi, 200 ips	30,335	230	860
F2123-00	Conversion Feature; converts 0872-02 to 0872-00	3,287	0	87
0873-00	Uniservo 32 Magnetic Tape Drive; 9-track, dual density GCR/PE, 6250/1600 bpi, 75 ips	27,552	208	799
0873-02	Uniservo 34 Magnetic Tape Drive; 9-track, dual density GCR/PE, 6250/1600 bpi, 125 ips	31,448	239	916
F2125-00	Conversion Feature; converts 0873-00 to 0873-02	4,011	31	106
0874-00	Uniservo 36 Magnetic Tape Drive; 9-track, dual density GCR/PE, 6250/1600 bpi, 200 ips	33,674	256	982
PRINTERS				
0770-00	Line Printer and Control; 800 lpm with 48 character set	56,304	341	1,300
0770-02	1400 lpm	64,896	447	1,498
0770-04	2000 lpm	86,686	681	3,167
F1533-00	160 Print Positions for 0770 Series Printers	4,416	24	102
F1534-00	Expanded Character Set Control, required for other than 48-character print cartridges	2,880	5	66
F2230-00	Printer Upgrade; 0770-00 to 0770-02	8,592	106	198
F2230-01	Printer Upgrade; 0770-00 to 0770-04	30,382	228	1,159
F2230-02	Printer Upgrade; 0770-02 to 0770-04	21,790	122	961
F2822-00	Dynamic Advance Control; reduces slew rate by 50 percent to optimize stacking of light forms	300	0	8
	Print Cartridges for 0770 Series Printers			
F1536-00	48-character Alphanumeric Business/Commercial	462	0	24
F1536-01	48-character Alphanumeric Scientific	462	0	24

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Sperry Univac 1100/80 System

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*
► PRINTERS (Continued)				
F1536-03	48-character Alphanumeric for United Kingdom	462	0	24
F1536-06	48-character ANSI standard OCR	462	0	24
F1537-00	94-character ASCII Graphic (ANSI X3.4-1968)	462	0	24
F1537-03	68-character ISO Universal OCR-B	462	0	24
F1537-04	68-character OCR H-14 Universal	462	0	24
F1537-05	58-character Cobol/Fortran/Business	462	0	24
F1537-06	177-character International	462	0	24
F1537-09	24-character Numeric	462	0	24
F1537-11	68-character Universal OCR-A	462	0	24
F1537-12	68-character Universal ECMA-11 OCR-B	462	0	24
F1537-13	68-character Universal Univac 77L OCR-B	462	0	24
F1537-14	63-character Modified Fortran	462	0	24
F1537-15	63-character Modified ASCII	462	0	24
F1537-19	384-character American Library Association	462	0	24
F1537-21	128-character OCR-A	462	0	24
F1537-23	94-character Optimized ASCII	462	0	24
F1537-24	68-character Optimized ISO Universal OCR-B	462	0	24
	(Cartridges are also available for languages other than English)			
0776-00	Line Printer and Control; 760 lpm with 48 character set	36,570	261	958
0776-02	900 lpm	41,340	312	1,080
0776-04	1200 lpm	52,150	356	1,363
F2217-00	Printer Upgrade; 0776-00 to 0776-02	4,770	51	122
F2245-00	Expanded Character Set Control; required for character sets with more than 64 characters	1,910	5	50
	Print Cartridges for 0776 Series Printers			
F2216-00	48-character Alphanumeric Business/Commercial	1,270	0	34
F2216-01	48-character Alphanumeric Scientific	1,270	0	34
F2216-07	24-character Numeric	1,270	0	34
F2216-08	63-character Modified Fortran	1,270	0	34
F2216-09	63-character Modified ASCII	1,270	0	34
F2216-10	48-character OCR-A	1,270	0	34
F2215-00	94-character ASCII	1,270	0	34
F2215-03	68-character ISO Universal OCR-B	1,270	0	34
F2215-04	68-character OCR H-14 Universal	1,270	0	34
F2215-05	58-character Cobol/Fortran/Business	1,270	0	34
F2215-06	177-character International	1,270	0	34
F2215-11	68-character Universal OCR-A	1,270	0	34
F2215-12	68-character Universal ECMA-11 OCR-B	1,270	0	34
F2215-13	68-character Universal Univac 77L OCR-B	1,270	0	34
F2215-20	94-character Optimized ASCII	1,270	0	34
F2215-21	68-character Optimized ISO Universal OCR-B	1,270	0	34
F2215-23	128-character OCR-A	1,270	0	34
0777-97	On-Line Laser printer; up to 21,000 lpm; one diskette with 15 character sets included	360,000	850	—
F3380-00/-01	Additional Character Sets	30	—	—
F2874-00	Character Font Expansion; up to 255 characters	3,640	16	104
F2876-00	Forms Overlay Capability	11,700	31	335
F3426-00	Overlay Transparencies	35	—	—
1963-00	Burster/Trimmer/Stacker	40,196	166	1,217
F3595-00	Forms Counter for 1963-00	1,580	5	38
F3598-00	Center Slitter for 1963-00; provides lengthwise separation of forms	900	10	21
F3601-00	One-Wide Roll Imprinter; for special printing on forms before bursting; requires 1963-00	1,060	25	25
F3601-01	Two-Wide Roll Imprinters; same as F3601-00, but provides two-wide printing	1,520	25	45
PUNCHED CARD EQUIPMENT				
0604-99	Card Punch and Control; 250 cpm	31,968	230	664
0716-02	Card Reader and Control; 1000 cpm; comes with code translator EBCDIC, ASCII, compressed code, or Fieldata code	15,504	154	358
F1487-00	51-Column Card Read Feature	1,968	16	45
F1487-01	68-Column Card Read Feature	1,968	16	45
F1488-00	Validity Check	816	0	18
F1498-00	Stacker Feature; permits the alternate filling of stackers one and two when in the stop-on-errors mode	528	0	12
F1468-00	Translate Mode Conversion; from EBCDIC to ASCII	105	0	0
F1486-01	Compressed Code to ASCII	105	0	0
F1486-02	ASCII to EBCDIC	105	0	0
F1486-03	Compressed Code to EBCDIC	105	0	0
F1486-04	ASCII to Compressed Code	105	0	0
F1486-05	EBCDIC to Compressed Code	105	0	0
F1486-06	To Fieldata Code	100	0	0
F1530-00	Adds a second translator to translate mode under program control	1,104	5	25

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Sperry Univac 1100/80 System

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*
COMMUNICATIONS/SYMBIONT SUBSYSTEM				
3021-99	Communications/Symbiont Processor; includes arithmetic/control unit, 16 general-purpose registers, and interval timer; requires card reader, F1276 channel adapter, 8542-00 general-purpose communications channel, and 32K words of storage	22,176	93	474
F1276-99	1100 Channel Adapter	5,544	31	119
F1418-00	Special Device Channel for addition of card reader	1,512	5	33
F1273-00	Selector Channel; requires F1577-00 I/O expansion and console; maximum 1 per 3021-99 processor	6,500	31	140
F1274-00	Multiplexer Channel; requires 48K words storage and F1577-00 I/O expansion	6,300	31	135
F1577-00	I/O Expansion; provides two additional I/O features	1,764	0	38
Storage for C/SP:				
7026-99	Storage; 32,768 bytes	42,840	195	915
7026-98	Storage; 49,152 bytes	64,260	293	1,373
7026-97	Storage; 65,536 bytes	85,680	379	1,830
7026-96	Storage; 98,304 bytes	128,520	533	2,745
7026-95	Storage; 131,072 bytes	171,360	688	3,660
F1775-94	Storage Expansion; 16,384 bytes; expands 32K storage to 48K	21,420	98	458
F1775-93	Storage Expansion; 16,384 bytes; expands 48K storage to 64K	21,420	84	458
F1784-98	Storage Expansion; 32,768 bytes; expands 64K storage to 96K	42,840	156	915
F1775-92	Storage Expansion; 32,768 bytes; expands 96K storage to 128K	42,840	154	915
8542-00	General-Purpose Communications Channel (GPCC); includes data transfer control, processor interface logic, multiplexer with 8 positions (4 communications line terminals), and one asynchronous timing source; accommodates 64 positions or 32 communications line terminals; maximum two GPCCs per Communications/Symbiont Processor	11,592	48	248
F1367-00	Multiplexer Expansion; adds 8 positions to 8542-00 GPCC; maximum 7 per GPCC	1,008	5	21
F1286-00	CLT Expansion Module	3,528	23	76
F1287-00	Active Line Indicators for lines 1 to 16 (32 indicators and 16 lines)	504	0	11
F1287-08	Active Line Indicators for lines 1 to 32 (64 indicators and 32 lines)	1,008	0	22
F1287-09	Active Line Indicators for lines 1 to 48 (96 indicators and 48 lines)	1,512	0	33
F1287-10	Active Line Indicators for lines 1 to 64 (128 indicators and 64 lines)	2,016	0	43
F1287-11	Active Line Indicators for lines 1 to 80 (160 indicators and 80 lines)	2,520	0	54
F1287-12	Active Line Indicators for lines 1 to 96 (192 indicators and 96 lines)	3,024	0	65
F1287-13	Active Line Indicators for lines 1 to 112 (224 indicators and 112 lines)	3,528	0	76
F1287-14	Active Line Indicators for lines 1 to 128 (256 indicators and 128 lines)	4,032	0	87
F1287-01	Line Indicator Expansion for lines 17 to 32	504	0	11
F1287-02	Line Indicator Expansion for lines 33 to 48	504	0	11
F1287-03	Line Indicator Expansion for lines 49 to 64	504	0	11
F1287-04	Line Indicator Expansion for lines 65 to 80	504	0	11
F1287-05	Line Indicator Expansion for lines 81 to 96	504	0	11
F1287-06	Line Indicator Expansion for lines 97 to 112	504	0	11
F1287-07	Line Indicator Expansion for lines 113 to 128	504	0	11
F1365-99	Asynchronous Timing Assembly (ATA); provides up to 3 timing sources for asynchronous communications line terminals; maximum two per GPCC	768	5	22
F1290-00	Asynchronous CLT; EIA RS-232B	352	5	7
F1290-01	Asynchronous CLT; Mil. Std. 188B	352	5	7
F1290-02	Asynchronous CLT; CCITT	352	5	7
F1290-03	Asynchronous CLT; Telegraph I	352	5	7
F1290-04	Asynchronous CLT; Telegraph II	352	5	7
F1291-00	Synchronous CLT; EIA RS-232B	1,764	14	38
F1291-01	Synchronous CLT; Mil. Std. 188B	1,764	14	38
F1291-02	Synchronous CLT; CCITT	1,764	14	38
F1291-04	Synchronous CLT; Telpak	2,268	14	49
F1292-00	Dialing Adapter, Single	768	5	17
F1292-01	Dialing Adapter, Double	1,512	5	33
GENERAL COMMUNICATIONS SUBSYSTEM				
8583-00	General Communications Subsystem (GCS); houses maximum of 32 communications terminals with interfaces and/or communication terminal dialers	24,000	110	625
F1971-00	Expansion Power Supply; required when 24 or more terminals are included in the GCS configuration	1,630	5	57
F1972-00	Spare CTC for controlling up to 32 lines in ESI mode on an I/O channel	7,200	44	248
F1973-00	Communication Terminal Asynchronous; up to 2400 bps, asynchronous bit serial transmission	1,920	12	50
F1973-01	Communications Terminal Asynchronous; same as F1973-02, but with external interrupt capability	2,880	17	101
F1973-02	Communication Terminal Asynchronous—VII; provides for block parity generation and checking	2,590	17	91
F1974-00	Communication Terminal Synchronous—Standard; up to 50,000 bps, synchronous bit serial transmission	2,880	16	75

*Rental prices do not include maintenance.

Sperry Univac 1100/80 System

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*

▶ **GENERAL COMMUNICATIONS SUBSYSTEM (Continued)**

F1974-01	Communications Terminal Synchronous; same as F1974-02, but with external interrupt capability	3,410	22	120
F1974-02	Communication Terminal Synchronous VII; provides for block parity and checking	3,070	22	108
F1975-00	Communications Terminal Synchronous; up to 56,000 bps, bit serial transmission	2,880	21	114
F1976-00	High-level Communications Terminal; provides capability to handle bit-oriented Data Link Control, up to 56,000 bps	3,600	23	127
F1977-99	Communication Terminal Dialer	530	3	18
F1978-00	Communication Interface—Telegraph	190	1	6
F1979-00	Communication Interface—Modem	480	2	13
F1979-01	Identical to CI—Modem (1979-00) except permits use of a modem not having a receive clock	530	3	18
F1980-00	Communication Interface—High-Speed (allows connection of a CTS—Std. or CTS—VII to the CCITT V.35 interface)	670	4	23
F1980-01	Communication Interface (allows connection of a CTS—Std. or CTS—VII to the ATT 303 modem or equivalent)	670	4	23
F1983-00	Spare Basic Clock	190	1	6
F1984-00	Expansion Clock (provides asynchronous timing rates not included in the basic clock)	190	1	6
F2072-00	Allows connection to a CTS—Std. or CTS—VII to a MIL 188C synchronous interface	530	3	18
F2074-00	Communications Interface—automatic inbound bit rate detection	1,100	3	38

DISTRIBUTED COMMUNICATIONS PROCESSORS

8597-99	Distributed Communications Processor/20 (DCP/20); free-standing unit including processor with 256K bytes of memory, operator panel, and maintenance panel; requires integrated flexible disk and controller plus free-standing flexible or cartridge disk; also requires a UTS 20 console or a UTS 400 attached to a communications line module	29,040	133	756
8597-01	DCP/20 Free-standing Expansion Cabinet; contains processor capable of performing I/O functions only; requires F1936-00 in basic cabinet; maximum of two per DCP/20 system	24,000	109	625
F3539-00	128K-byte Memory Increment; maximum of two per DCP/20	4,500	22	131
F3539-99	256K-byte Memory Increment; maximum of one per DCP/20	8,650	44	225
F2894-00	Line Module Expansion; provides for an additional 8 line modules in 8957-01	12,000	55	460
F2895-00	Active Line Indicator; provides a visual display of line activity on up to 16 half/full duplex communications lines	890	4	25
8406-04	Free-standing Diskette Drive; one megabyte of storage	3,600	22	103
F3145-00	Diskette Expansion; provides additional drive	2,160	11	61
8596-96	Distributed Communications Processor/40 (DCP/40); free-standing unit including processor 512K bytes of memory, I/O controller module, IOP, and control storage; requires integrated flexible disk plus free-standing cartridge disk and communications line module; also requires a UTS 20 console or a UTS 400 attached to a communications line module	84,245	415	2,195
K1930-01	512K-byte Memory Increment; three may be added to 8596-96; additional memory uses 1945-00	15,600	116	410
1945-00	DCP/40 Free-standing Expansion Cabinet; contains power supply and power controller; accommodates up to four IOPs or three storage banks of up to 512K bytes each; maximum of three per system, only one of which may contain storage	27,060	134	705
F2942-00	Storage Controller; supplied with 128K bytes of memory; mounts in 1945-00; up to two F1929-99 and nine 128K-byte memory modules may be added	26,880	133	700
F1929-99	Storage Controller Expansion; includes 128K bytes of memory; provides control for 512K bytes of memory; required for storage banks three and four; mounts in F2942-00	13,950	71	365
F1933-00	IOP Controller Module; mounts in 1945-00; includes IOP and space for three additional IOPs and storage port expander	14,680	72	380
F2941-99	Second IOP Expansion; provides second IOP for 8596-96 or 1945-00; includes power for two more IOP expansions	14,920	74	390
F1932-99	Third IOP; mounts in 1945-00 or 8596-96; includes storage port expander	14,185	70	370
F1932-98	Fourth IOP; mounts in 1945-00 or 8596-96	10,635	52	280
F1928-00	Operator Station; work surface for local console and free-standing flexible disk unit	1,200	0	30
F1825-05	Active Line Indicator; provides a visual display of line activity on up to 16 communications line modules on an IOP; mounts on top of cabinet containing IOP	960	4	25
F1949-00	8-bit Interface for 8406 flexible disk	1,045	4	30
F1800-02	Series 90 Byte Interface Switch; provides the capability to manually switch F1947-00 between selector/multiplexer channels of a single host CPU or to separate host CPUs	4,305	17	83

Features for the DCP/20 and DCP/40:

F1939-00	Integrated Flexible Disk Subsystem; includes 256K-byte flexible disk and controller; mounts in 8596-96 or 8597-99; one required	1,920	11	50
F1936-00	Storage Port Expander; provides a multiplexed interface to a single local storage access port for up to four requestors	3,550	17	95
F1946-02	1100 Series ISI Interface; provides a full-duplex ISI interface to a word channel; maximum of two per DCP/20 cabinet or four per DCP/40 cabinet	4,000	21	105
F1947-00	Series 90 Byte Interface; provides interface to Series 90 byte or block multiplexer channel; maximum of one per DCP/20 cabinet or two per DCP/40 cabinet	4,000	21	105
F1948-01	16-bit Peripheral Interface; provides interface to a peripheral subsystem; allows operation in 8- or 16-bit mode	3,000	15	80
F1941-00	Full-Duplex Interface to Asynchronous Data Sets; conforms to EIA RS-232-C and CCITT V.24 and V.28; data set rates up to 2400 bps	960	3	25

*Rental prices do not include maintenance.

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NOVEMBER 1982

Sperry Univac 1100/80 System

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-year lease)*
DISTRIBUTED COMMUNICATIONS PROCESSORS (Continued)				
F1942-00	Full-Duplex Interface to Synchronous Data Sets; conforms to EIA RS-232-C and CCITT V.24 and V.28; data set rates up to 9600 bps	960	3	25
F3163-00	Full-Duplex Interface to Synchronous or Asynchronous Modems; conforms to EIA RS-232-C and CCITT V.24 and V.28; operates with Bell DDS up to 9600 bps or at data set rates up to 19,200 bps	1,275	7	35
F3163-01	Full-Duplex Interface to Public Data Networks; conforms to CCITT X.21 and X.25; operates at rates up to 19,200 bps	2,500	13	63
F3164-01	Full-Duplex Interface to Carrier Facilities; conforms to CCITT V.35; operates with UDLC protocol data formats (64K bps), V.35 facilties (48K bps), and Bell DDS and DSDS facilities (56K bps)	3,745	19	100
F3835-00	Remote Partitioning Capability; maximum of one on DCP/20 or four on DCP/40	960	5	25
F1945-00	Auto Dialing Line Module; interfaces to Bell 801 Automatic Calling Units or those conforming to CCITT V.24 and V.25	1,005	4	25
8408-02	Cartridge Disk Control; controls up to two F2380 drives	5,564	29	139
F2380-04	Fixed/Removable Cartridge Disk Drive; five megabytes fixed, five megabytes removable	17,750	114	439
F2187-00	Second I/O Interface for dual F2380 configuration	1,568	8	39
0871-01	Uniservo 10 Magnetic Tape Unit; 9-track, PE/NRZI, 1600/800 bps, 25 ips	13,962	85	318
F2721-00	Uniservo 10 Controller; controls up to two drives	10,320	51	284
F2879-00	AC Power Switch; provides remote control of second Uniservo 10	1,200	5	32
3560-93	UTS 20 DCP Console; includes 12-inch CRT, keyboard, and communications interface	3,225	30	128
0797-99	Printer; 80 cps; connects to DCP/20 or DCP/40	1,900	27	84
0798-99	Printer; 200 cps, bidirectional; connects to UTS 20	6,650	64	188

*Rental prices do not include maintenance.

SOFTWARE PRICES

		Monthly Lease Charge
System Processors		
6163-00	Terminal Security System	$189
6167-00	Sentry Security Control Processor	635
6158-00	Quota Input Processor (QUIP)	189
6162-00	Checkpoint/Restart	126
6133-00	Data Processor	63
Utility Processors		
6271-00	CULL Processor	25
F3859-00	Interactive CULL (IACULL)	25
6203-00	Fault Location of Interpretive Testing (FLIT)	116
6135-00	Sort/Merge	126
6246-00	Log Analyzer	120
6161-00	Performance Analysis Routines	252
6274-99	On-Line System Activity Monitor (OSAM)	250
Communications Processing		
6169-94	Communications Management System (CMS) 1100 DCP/20	500
6169-96	CMS 1100 DCP/40	600
6148-00	CMS 1100 (interfaces with TIP)	650
6169-98	CMS 1100 GCS	650
6169-92	CMS 1100 DCP/GCS	650
6159-00	Processor Common Communications System (PCCS)	126
6136-95	DCP/20 Operating System	100
6136-01	DCP/40 Operating System	165
6136-00	DCP/40 DCP Emulate Operating System	114
6144-00	DCP/40 MCC Emulate Operating System	95
6276-00	BSC 3270 Terminal Handler	150
Data Base/Transaction Processing		
6292-99	Universal Data System (UDS) 1100 Control	250
6700-99	UDS Data Management System (DMS) 1100	1,200
6296-99	UDS Processor Common Input/Output System (PCIOS)	100
6293-99	UDS Relational Data Management System (RDMS) 1100	1,500
6299-99	UDS Data Dictionary System	750
6177-00	Define File Processor	63
6175-00	Integrated Recovery Utility (IRU)	383
6175-01	IRU Version II	400

Sperry Univac 1100/80 System

SOFTWARE PRICES

		Monthly Lease Charge
► Data Base/Transaction Processing (Continued)		
6175-97	IRU Version III	600
6291-99	File Acquisition System (FAS)	300
6291-97	Secure to FAS Upgrade	150
6155-00	Data Management System (DMS) 1100	956
6700-97	DMS 1100 to UDS DMS 1100 Upgrade	244
6176-00	Data Dictionary	383
6152-00	Processor Common Input/Output System (PCIOS)	63
6296-97	PCIOS to UDS PCIOS Upgrade	37
6244-00	Information Management System (IMS) 1100	195
6237-00	Display Processing System (DPS) 1100	289
End User Products		
6146-00	Mapper 1100	978
6290-99	Advanced Information Service (Advise) 1100	300
6157-00	Query Language Processor (QLP) 1100	383
6156-00	Remote Processing System	252
Interactive Processing		
6170-01	Conversational Time-Sharing System (CTS) 1100	275
6147-00	High-Volume Time-Sharing (HVTS)	635
6262-99	Interactive Processing Facility (IPF) Command Language	275
6260-99	IPF Control	200
6263-99	IPF Procedures	350
6245-99	Edit 1100	290
6264-99	User Assistance	75
6261-99	Distributed Data Processing (DDP) 1100	100
Language Processors		
6165-00	General Syntax Analyzer	110
6172-00	APL 1100	509
6171-00	UBasic	126
6178-00	UBasic Syntax Analyzer	63
6153-00	ASCII Cobol	252
6149-00	Cobol Syntax Analyzer (BCOB)	126
6154-00	ASCII Fortran	383
6150-00	Fortran Syntax Analyzer (BFTN)	126
6151-00	PL/1	252
6164-00	RPG 1100	126
6243-99	RPG II Group	130
6160-00	MACRO	126
6239-00	Programmers Advanced Debugging System (PADS) 1100	210
6251-00	Requirements and Development Processor (RDP)	1,000
Miscellaneous Programs		
F3791-99	Univac Printer Interface Software (UPRINTS); provides interface to 0777 Laser Printer	200
F3793-99	Cache Disk Interface Software (CADIS)	400■