Sperry 1100/70

MANAGEMENT SUMMARY

Since its initial introduction in June 1983, the 1100/70 Series of medium- to large-scale computer systems has been expanded to include a three-processor and a four-processor system. The new 1100/73 consists of three Model H1 or H2 processors with a total of 24K words of buffer storage, two or three Input/Output Units, and two System Support Processors (SSPs). The 1100/74 processor complex includes four Model H1 or H2 CPUs with a total of 32K words of buffer storage, two or four Input/Output Units, and two SSPs. Both systems support 1024K words to 8192K words of main memory, which must be housed in an external cabinet. These multiprocessors have been added to the existing 1100 Series as growth path alternatives which provide users with a wider performance range.

Essentially, the 1100/70 central processor is an enhanced version of the 1100/60 processor, which it will eventually replace. The 1100/61 and 1100/62 can be upgraded to an 1100/70 Series system. Five basic 1100/70 Series configurations are available: the unit processor 1100/71 systems, the dual processor 1100/70 systems, and the multiprocessor 1100/72, 1100/73, and 1100/74 systems. Both the 1100/70 and 1100/72 systems include two central processors. The 1100/70 consists of two tightly coupled CPUs that share one I/O Unit, one System Support Processor, and one system console. The 1100/72 systems are fully redundant systems with two CPUs, two I/O Units, two System Support Processors, and two system consoles.

The 1100/70 family is designed for interactive processing as well as batch and transaction processing. The new systems support all of the peripheral devices and software currently available for the 1100/60 Series.

All models in the 1100/70 family include the same 116-nanosecond central processor, which features multiple microprocessors, parallel instruction execution, control store error correction, and instruction retry. The E models include 2K words of buffer storage, and the H models include 8K words of buffer storage. Models B1, C1, E1, and H1 use the standard 1100 Series instruction set, while Models C2, E2, and H2 include the Extended Instruction Set (EIS). The C1, E1, and H1 can be upgraded to a C2, E2, or H2 with the addition of the EIS. In addition, the B model can be upgraded to a C model, the C models can be upgraded to E models, and the E models can be upgraded to H models.

The basic 1100/70 Processor Complex consists of the CPU, main memory, buffer storage (Models E and H only), System Support Processor (SSP), I/O Unit (IOU), and system console with printer. Dual processor and multiprocessor systems also include a maintenance console. The SSP provides system management, support for diagnostics and maintenance, and console handling. Each standard IOU includes one block multiplexer channel and four word channels. An IOU can be expanded to include up to 14 channels.

The 1100/70 is a family of medium- to large-scale computer systems that features a multiple-microprocessor implementation of the 1100 Series architecture. Both uniprocessor and multiprocessor configurations are available.

MODELS: 1100/71 B1, C1, C2, E1, E2, H1, and H2; 1100/70 E1, E2, H1, and H2; 1100/72 El, E2, H1, and H2; and 1100/73 and 1100/74 H1 and H2.
CONFIGURATION: From 1 to 4 CPUs, 512K to 8192K words of main memory, 1 to 4 IOUs, and 1 to 8 consoles.
COMPETITION: IBM 4341; Burroughs B 4900, B 5900, A 9 Series; Honeywell DPS 8; and NCR V-8500 and V-8600.
PRICE: Purchase prices for basic Processing Complexes range from $188,000 to $840,040.

CHARACTERISTICS

MANUFACTURER: Sperry Corporation, P.O. Box 500, Blue Bell, Pennsylvania 19424. Telephone (215) 542-4011. In Canada: Sperry, Inc., 55 City Center Drive, Mississauga, Ontario.

DATE ANNOUNCED: June 1983.

MODELS: 1100/71 B1, C1, C2, E1, E2, H1, and H2; 1100/70 E1, E2, H1, and H2; 1100/72 E1, E2, H1, and H2; and 1100/73 and 1100/74 H1 and H2.

DATA FORMATS

BASIC UNIT: A 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 C2, E2, and H2 processor models can perform decimal addition and subtraction operations on 9-bit bytes, packed 4 to a word.

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.

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Sperry also offers the Attached Virtual Processor (AVP) for users upgrading from a Series 90/60 or 90/80 to an 1100/70 system. The AVP provides concurrent execution of applications written for the Series 90 Operating System and applications written for the 1100 Series Operating System.

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 realtime (or communications). Operating facilities include dynamic storage allocation, reentrancy, multiprocessing, dynamic reconfiguration, automatic recovery, multilevel 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, like most other mainframe manufacturers, places a strong marketing emphasis on data base and data communications software. Considerable emphasis is placed on end user software. A concentration on engineering and scientific applications software is also apparent.

Within the realm of data communications, three Distributed Communications Processors are available to serve as front-end processors, network processors, or remote concentrators. The DCPs support UDLC, bisync, synchronous, and asynchronous transmission. Depending on the model, the DCPs can accommodate from 8 to 256 communications lines. In addition to the DCPs, the 1100/70 also supports the older General Communications Subsystem (GCS). The GCS supports communications networks of up to 32 half- or full-duplex lines at up to 50,000 bits per second.

Sperry's Distributed Communication Architecture (DCA) can support a broad range of host processors and terminal attachments, including other manufacturers' equipment. Sperry has stated that 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.

COMPETITIVE POSITION

Traditionally, Sperry Corporation has concentrated much of its marketing effort on two key computer markets—manufacturing and energy. Like other members of the word-oriented 1100 Series, the 1100/70 systems are well suited to both scientific and business data processing.

According to Sperry, the 1100/71 B1 is equivalent in performance to IBM's 4341 Model Group 9, the 1100/71 C1 to the 4341 Model Group 10, the 1100/71 C2 to the 4341 Model Group 1, and the 1100/71 E1 and E2 to the 4341 Model Group 11. The 1100/71 H1 and H2 are equal to the 4341 Model Groups 2 and 12, respectively. The 1100/70 systems are also competitively marketed against

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 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: N-channel MOS using 64K-bit chips. Memory is housed in the processor cabinet.

CAPACITY: See Table 1 for the capacities of individual models. Located in the central complex cabinet, a minimum of 512K words is expandable in 512K increments to a maximum of 4096K words. This type of main storage can only be used with 1100/71 and 1100/72 systems. A free-standing Main Storage Unit (MSU), which is required with the 1100/73 and 1100/74 systems, has a minimum capacity of 1024K words, expandable in 1024K-word increments to a maximum of 8192K words per cabinet.

CYCLE TIME: Read/write cycle time of 580 nanoseconds; 625 nanosecond access to corrected read data; and 928-nanosecond partial write cycle. Single and partial word writes are available. In dual processor and multiprocessor systems, storage modules may be interleaved under control of the System Support Processor (SSP) software.

CHECKING: The Main Storage Unit (MSU) contains circuitry for single-bit error detection and correction and detection of double-bit errors. Multiples of double-bit errors and some odd multiples of double-bit errors are also detected. Memory errors are detected using a 7-bit hamming code generated for all read and write operations.

A parity bit with each half-word is checked whenever storage is referenced for I/O transfers via the two IOU interfaces. The MSU also detects single-bit address errors and out of bounds addresses.

STORAGE PROTECTION: The Bank Descriptor Registers (BDRs) loaded by the 1100 Operating System define 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 a guard mode interrupt. The setting of a bit in the Designator Register determines whether the protection is against write operations; read, write, or jump operations; or whether no protection exists. In the first case, the operating system is in privileged mode. Under this mode, privileged programs such as realtime programs or executive controlled subroutines may enter nonalterable (reentrant) subroutines for reading or jumping only. In the second case, the operating system is in user mode. In the third case, the BDRs are loaded but ignored since the operating system is in OPEN mode. Registers BDR0 and BDR1 correspond to I-bank (instruction word) address ranges and Registers BDR2 and BDR3 correspond to D-bank (data word or operand) address ranges.

RESERVED STORAGE: The low end of memory is reserved for storing the processor state during interrupts. The processor state consists of the program status, addressing status, and interrupt status. Interrupt routines and the general register stack are also located in the low end of memory.

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the Burroughs B 4900, B 5900, and A 9 Series of medium- to large-scale mainframes. The memory capacities of the Burroughs B 4900 and Burroughs B 5900, and Burroughs A 9 position these systems below the 1100/70 Series which offers a memory capacity expandable to 32 megabytes. In addition, the NCR V-8500 and V-8600 Systems along with Honeywell's DPS 8 system compete with Sperry in the general-purpose business market.

A viable contender in the scientific and engineering realm, Control Data Corporation poses a realistic challenge to Sperry with the recently released Cyber 180 family. Both word-oriented systems, the Sperry and CDC machines offer increased number crunching accuracy and comparable performance levels which will attract members of the scientific community.

ADVANTAGES AND RESTRICTIONS

Sperry offers users a growth path both within the 1100/70 family and throughout the 1100 Series product line. The high-end 1100/72 Model H2 offers five times the performance of the entry-level 1100/71 Model B1. The 1100/70 offers four times the internal memory capacity of Sperry's 1100/60 system. Sperry's top-of-the-line 1100/94 offers a 55-fold increase over the 1100/71 B1.

Within the 1100 Series, Sperry has maintained a high degree of program and data compatibility. This has been continued with the 1100/70, 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 or competitive computers. However, the 1100 Series implementations of the Cobol, Fortran, Algol, Basic, PL/1, and Pascal languages 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 has gradually revised all 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.

Availability, reliability, and maintainability (ARM) features include duplicate microexecution units that allow parallel execution of instructions, as well as duplicates of the shifter, logic function section, and control store address generator. Also included is an instruction retry mechanism that allows the system to recover from most transient faults, transparent to the operating system. TRACE, the Total Remote Assistance Center, provides remote hardware maintenance via telephone lines.

USER REACTION

We elicited responses from eleven 1100/70 users for inclusion in Datapro's 1984 Computer User Survey. Of the systems represented, seven were leased from the manufacturer, three were purchased, and one was leased from a third party. Memory capacity on the installed systems ranged from 2MB to 32MB. Disk storage varied from

BUFFER STORAGE (E and H models only)

STORAGE TYPE: IC semiconductor.

CAPACITY: 2048 words per CPU in E models, 8192 words per CPU in H models. Buffer storage is located in the Storage Interface Unit (SIU). A read request results in a serial retrieval of a four-word block from the MSU—the requested word and three adjacent words. Subsequent read references to the same or adjacent words in the block are presented at SIU speed with no further reference to the MSU required. The words in the buffer are divided into 512 sets. Each set contains four 4-word blocks. The SIU employs a Paired Least Recently Used (PLRU) algorithm to control aging and replacement of data blocks within each set. In case of buffer malfunction, the affected blocks are automatically bypassed.

CYCLE TIME: 116 nanoseconds per word.

CENTRAL PROCESSOR

All models of the 1100/70 series employ the same basic 116-nanosecond CPU, which is a multimicroprocessor implementation of the 1100 Series architecture. The processor contains two microexecution units that concurrently execute parts of the same microinstruction (see below). Complete execution of every microinstruction requires four cycles. Speed is enhanced by overlapping execution of microinstructions. To further increase performance, microprocessor functions are generated using a phantom branching technique in which one of two functions is selected for execution in each microprocessor, one cycle after microaddress selection.

The concept of availability, reliability, and maintainability (ARM) was an important consideration in the design of the 1100/70 series processor, according to Sperry. To implement ARM, Sperry provided duplicates for the microinstruction units, executing the same function on the same data in the duplicate unit and comparing the results at the end of each cycle. Similarly, the shifter, logic function section, and control store address generator are also duplicated. The 1100/70 also includes a hardware instruction retry mechanism that allows the system to recover from most transient faults, transparent to the operating environment.

The hardware monitor feature enables an 1100/70 series processor to collect system profile performance data on hardware and software. Sampling of data can be initiated by software or operator request. The signals are sampled every 475 microseconds and collected by the System Support Processor (SSP) every 25 seconds for storage in the system log for later report generation.

The 1100/70 series processor also includes an interprocessor interrupt interface that allows operational control by the operating system to permit a CPU to interrupt another CPU or to be interrupted by another CPU in a multiprocessor environment.

CONTROL STORAGE: Consists of 2000 words where each word is 36 bits wide. Control storage has an access time of 50 nanoseconds.

REGISTERS: The 1100/70 series processor contains a general register stack (GRS) that consists of 36-bit integrated circuit registers with a basic cycle time of 116 nanoseconds. The GRS includes 128 program addressable control registers with some overlap of function and some areas guard mode protected (e.g., the executive system of the operating system). The GRS includes an unassigned nonindexing register; 15 index registers; 4 registers that can be used for either indexing or accumulation; 16 accumulators;

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TABLE 1. CHARACTERISTICS OF THE 1100/70 SERIES SYSTEMS

	1100/71 B1	1100/71 C1, C2	1100/71 E1, E2	1100/71 H1, H2	1100/70 E1, E2
SYSTEM CHARACTERISTICS					
Date of introduction	June 1983	June 1983	June 1983	June 1983	June 1983
Date of first delivery	June 1983	June 1983	June 1983	June 1983	June 1983
Number of central processors	1	1	1	1	2
Number of system support processors	1	1	1	1	2
Number of system consoles	1-4	1-4	1-4	1-4	2-8
CPU cycle time, nanoseconds	116	116	116	116	116
Relative performance	1.0	1.2 (C1), 1.6 (C2)	1.9 (E1), 2.2 (E2)	2.8 (H1), 3.3 (H2)	3.5 (E1), 4.2 (E2)
MAIN STORAGE					
Storage type	64K-bit NMOS	64K-bit NMOS	64K-bit NMOS	64K-bit NMOS	64K-bit NMOS
Cycle time, nanoseconds	580	580	580	580	580
Minimum capacity, words	512K	512K	512K	512K	1024K
Maximum capacity, words	4096K	4096K	4096K	4096K	8192K
Increment size, words	512K-1024K	512K-1024K	512K-1024K	512K-1024K	512K-1024K
BUFFER STORAGE					
Cycle time, nanoseconds	—	—	116	116	116
Capacity, words	—	—	2K	8K	4K
I/O CHANNELS					
Number of I/O units	1	1	1	1	1
Number of word channels	4 to 12	4 to 12	4 to 12	4 to 12	4 to 12
Number of block multiplexer channels	3 to 5	3 to 5	3 to 5	3 to 5	3 to 5
Channel data rates, words per second:	615K	615K	615K	615K	615K
Word channels	718K	718K	718K	718K	718K
Block multiplexer channels	371K	371K	371K	371K	371K

600MB to over 4800MB with the majority of users employing between 1200MB and 4800MB. Two users reported having between 6 and 15 local workstations; three had between 16 and 30; another three reported having between 31 and 60; and three respondents employed over 60 local workstations. In addition, the majority of users stated that they utilized between 6 and 30 remote workstations.

The Sperry systems surveyed were installed in the following industries: Manufacturing, Health Care/Medical, Service Bureau, Engineering/Scientific, and Banking/Finance. The most common applications being processed included accounting/billing, order processing/inventory, process control, engineering/scientific, petroleum/fuel analysis, payroll/personnel, sales/distribution, and purchasing. Only one user didn't utilize a data base management system, with most respondents providing a favorable reaction to Sperry's Mapper system. According to the survey results, Cobol was the most frequently used programming language; two respondents reported using Fortran.

In discussing the advantages of their Sperry systems, most users mentioned that relative ease of keeping up with vendor changes to hardware/software, ease of operation, and system reliability were among the major system strengths. When considering system drawbacks, some users indicated compatibility problems when carrying over terminals and peripherals from other systems, power/energy insufficiencies, and a lack of software support. Four users reported that the delivery of required software was behind schedule. When asked about future acquisition plans, the respondents revealed intentions to expand present hardware, expand data communications facilities, add business graphics, and increase the amount of both proprietary and vendor-supplied software.

and the processor state control registers consisting of 2 pointer registers, the Executive Bank Descriptor Table Pointer and the User Bank Descriptor Table Pointer. There are 11 interrupt status words, including the Immediate Storage Check Designator Register and Guard Mode Designator Register, a quantum timer, Bank Descriptor Table Indexes, and jump history stack; 16 special registers, including the Realtime Clock (guard mode protected), Repeat Count Register, Mask Register, and user registers R3 through R15; 16 special guard mode protected executive registers, such as Executive Registers R0 and R3 through R15; Repeat Count Register and Mask Register; a guard mode protected (executive) nonindexing register; 15 executive index registers; 4 executive registers for indexing or accumulation; and 16 executive accumulators.

The Realtime Clock is initially loaded by the program and decremented once every 200 microseconds. The Repeat Count Register controls repeated operations such as block transfer and search instructions. The Mask Register is used with the search command in determining which portions of words are to be compared in repeated masked search operations. The Jump History Stack holds the recent 24-bit absolute addresses of jump instructions. The Quantum Timer, once loaded with an initial value, is decremented every 116 nanoseconds of actual CPU use, provided that a bit in the Designator Register is set. The Bank Descriptor Registers are described in the section entitled Storage Protection. The Designator Register generally determines functioning characteristics of the CPU.

The Breakpoint Register is employed with the address breakpoint mechanism. It allows an interrupt to be initiated when an equality comparison is made between the absolute address in the register or an operand address. The Breakpoint Register is operational on all instruction addresses, read/write references to main memory, and I/O references to main memory.

ADDRESSING: The 1100/70 series has an address range of 16 million words. Both indirect and direct addressing are possible. Indirect addressing is possible to any desired number of levels, with full indexing capabilities at each level. Operand addresses can be modified by the contents of any of 19 index registers. If desired, the contents of the

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TABLE 1. CHARACTERISTICS OF THE 1100/70 SERIES SYSTEMS (Continued)

	1100/70 H1, H2	1100/72 E1, E2	1100/72 H1, H2	1100/73 H1, H2	1100/74 H1, H2
SYSTEM CHARACTERISTICS					
Date of introduction	June 1983	June 1983	June 1983	January 1984	January 1984
Date of first delivery	June 1983	June 1983	June 1983	2nd qtr.	2nd qtr.
Number of central processors	2	2	2	3	4
Number of system support processors	2	2	2	2	2
Number of system consoles	2-8	2-8	2-8	2-8	2-8
CPU cycle time, nanoseconds	116	116	116	116	116
Relative performance	5.2 (H1), 6.4 (H2)	3.5 (E1), 4.2 (E2)	5.2 (H1), 6.4 (H2)	7.6 (H1), 9.3 (H2)	9.9 (H1), 11.9 (H2)
MAIN STORAGE					
Storage type	64K-bit NMOS	64K-bit NMOS	64K-bit NMOS	64K-bit NMOS	64K-bit NMOS
Cycle time, nanoseconds	580	580	580	580	580
Minimum capacity, words	1024K	1024K	1024K	1024K	1024K
Maximum capacity, words	8192K	8192K	8192K	8192K	8192K
Increment size, words	512K-1024K	512K-1024K	512K-1024K	512K-1024K	512K-1024K
BUFFER STORAGE					
Cycle time, nanoseconds	116	116	116	116	116
Capacity, words	16K	4K	16K	24K	32K
I/O CHANNELS					
Number of I/O units	1	2	2	2 or 3	2 or 4
Number of word channels	4 to 12	4 to 12	4 to 12	4 to 12	4 to 12
Number of block multiplexer channels	3 to 5	3 to 5	3 to 5	3 to 5	3 to 5
Channel data rates, words per second:	615K	615K	615K	615K	615K
Word channels	718K	718K	718K	718K	718K
Block multiplexer channels	371K	371K	371K	371K	371K

As part of the survey, users were asked to rate their Sperry equipment from excellent to poor in several categories. A weighted average was then calculated based on the total number of responses. A summary of these ratings is included in the following table.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	5	5	1	0	3.36
Reliability of mainframe	7	3	1	0	3.55
Reliability of peripherals	5	5	1	0	3.36
Maintenance service:					
Responsiveness	6	3	2	0	3.36
Effectiveness	6	2	3	0	3.27
Technical support:					
Troubleshooting	2	7	2	0	3.00
Education	1	5	4	1	2.55
Documentation	1	2	8	0	2.36
Manufacturers software:					
Operating system	5	5	1	0	3.36
Compiler & assemblers	6	5	0	0	3.55
Application programs	3	2	4	0	2.89
Ease of programming	7	3	1	0	3.55
Ease of conversion	5	3	2	1	3.09
Overall satisfaction	6	4	1	0	3.45

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

We interviewed four Sperry users and asked them for additional feedback regarding their 1100/70 equipment.

The first user interviewed represented a West Coast bill collection service that had converted to an 1100/70 system from a Sperry System 90/30. Overall, this user was well satisfied with his system and stressed system reliability as a major advantage. During the last year, he recalled only one power failure that occurred in the central processor and caused a power outage for approximately an hour. This user employed his 1100/70 system to process between 4500-5000 daily delinquent accounts. At the present moment, this user was utilizing Sperry's Telcon communica-

index register can be automatically incremented by any specific value each time the register is referenced.

INSTRUCTION REPERTOIRE: The 1100/70 series has 161 standard 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 1100/70 system, additional privileged instructions are included, and an optional Extended Instruction Set (EIS) is also available.

Most instructions specify the address of one operand in main storage and one of the accumulators. Complete binary arithmetic facilities are provided for single precision fixed-point and both single and double precision floating-point operands. Addition and subtraction can also be performed on double precision fixed-point operands and on 18-bit half-words and 12-bit third-words. Also included are extensive facilities for testing, shifting, searching, and logical operations.

The instruction set is broken down as follows: 11 load instructions, 8 store instructions, 20 fixed-point arithmetic instructions, 16 floating-point arithmetic instructions, 14 repeated search instructions, 14 test or skip instructions, 12 shift instructions, 17 executive system control instructions, 29 jump instructions, 4 logical instructions, 11 miscellaneous instructions, 5 I/O instructions, and 20 optional EIS instructions.

EIS includes bit string instructions for moving, comparing, and translating character or byte fields; decimal arithmetic and edit instructions; and instructions for converting between ASCII, decimal, and binary notation. Sperry states that gains realized by the use of EIS can be expected to be in the range of 25 to 35 percent for heavy Cobol/DMS batch type environments.

INSTRUCTION TIMINGS: Sperry states that instruction timings for the 1100/70 will be made available only to "qualified" users or consultants.

INTERRUPTS: A program interrupt facility causes storage of the current processor state in the three groupings of program status, address status, and interrupt status from

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tions monitor with his 15 local workstations for teleprocessing control applications. He identified the on-line network modification feature as one of Telcon's most beneficial capabilities. In discussing system disadvantages, the sparse amount of applications software was mentioned. Although he didn't have an immediate need for additional software, he would probably evaluate financial software if Sperry could supply him with some software suited for his applications. When rating the compatibility of terminals and peripherals carried over from other systems, he reported that problems had arisen when converting the disks used on the previous Sperry 90/30 system to its 1100/70 replacement. An expensive controller was required for the conversion and even then the transportability of the disk drives was questionable.

A user involved with a Southwestern service bureau leased a Sperry 1100/72 system for processing a range of applications including accounting/billing, insurance and mathematics and statistics. Reporting that although no other machine on the market could surpass Sperry in terms of hardware performance and reliability, he wished they would "get their act together" in the technical support and software areas. He reported that in order to install a new operating system it was necessary to acquire seven additional packages. When trying to install Fortran on his system, he encountered the same problem and upon turning to the documentation his problems were compounded by missing or inaccurate information. He added that calling Sperry with his questions didn't offer an immediate solution to the dilemma because many times there was no one available who could assist him. However dissatisified with his Sperry software dealings, this user had successfully employed the vendor's Mapper data base management system and reported no problems with performance and support. He added that Mapper wasn't handled in the normal realm of Sperry software since this proprietary package was supported by the manufacturing branch.

Another Sperry user located on the East Coast was using his Sperry 1100/72 for banking and check processing at a medium-sized savings and loan office. Although the delivery and installation of his equipment was several months behind schedule, he rated system reliability, ease of operation, and power/energy efficiency excellent. Contrary to a previous user's comment concerning software inadequacies, this user was well-satisfied with applications programs supplied by the vendor and reported no major difficulties encountered while employing the DMS-11 data base package or the CMS communications system. The majority of the programs currently used at this installation had been supplied by Sperry for financial applications ranging from loan amortizations to financial modeling and spreadsheet analysis. In addition, intentions to implement further Sperry software offerings were in the works.

We also spoke with a Sperry user with a Midwest installation who was using a Sperry 1100/70 system for engineering/scientific and petroleum/fuel analysis applications. Having converted from a Modcomp system, this user reported that no problems impeded the conversion and

the Processor State Register's 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.

There are 24 priority level interrupts available in the 1100/70 series processors. Priority levels 0 through 10 are internal interrupts, which can neither be locked out nor deferred. The remainder are deferrable interrupts that can be locked out. All external interrupts are presented to each CPU in the system. Therefore, an interlocked synchronization mechanism is provided to ensure that only one CPU actually accepts the interrupt request.

PHYSICAL SPECIFICATIONS: The 1100/70 central complex cabinet is 30 inches deep, 78 inches wide, and 64 inches high. The cabinet weighs approximately 1500 pounds. Power requirements for the basic CPU complex cabinet is 7KVA, 60 Hz. A motor alternator is not required. Cooling required by the CPU complex is less than 1500 cubic feet per minute forced air, supplied from room air or false floor. Sperry quotes the heat dissipation as less than 24,000 Btu per hour. Recommended temperature for the typical system is 75 degrees Fahrenheit with a relative humidity of 50 percent noncondensing.

SYSTEM SUPPORT PROCESSOR (SSP): The 1100/70 SSP provides partitioning, system control, maintenance, and console management functions. The SSP is a standalone desk-sized unit that interfaces, via the Support Controller, to the CPU complex and its component parts, including the CPU, IOU, MSU, and SIU. A basic configuration for the SSP includes CRT/keyboard/printer console, 128K bytes of addressable storage, a console interface, diskette drive interface, remote maintenance interface, and central complex interface.

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. Partitioning is supported via partitioning panel displays. The SSP also defines special system protection modes such as realtime and maintenance modes.

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 control the partitioning of subsystems is also provided.

Two partitioning features are built into the IOU. One feature controls shared peripheral interface units on word channels, and the other controls the byte channel transfer switch for subsystems connected to a block multiplexer channel. The SSP provides control of system functions such as clocks and timers, stop jump control, initial load path, and auto recovery through system operator panel displays on the console. An optional System Performance Monitor (see Software) is also under SSP control.

The SSP acts as a primary maintenance tool through functions such as control storage loading, fault corrections, scan/set data comparisons, error logging, and a remote maintenance capability. One of the tools available to the SSP for maintenance is the Logic Analyzer, which provides a means of sampling and recording logic signals at discrete intervals of time. Not only does the SSP control the sampling rate, but also the starting/stopping of logic signal recording.

The SSP also acts as the communications link between the 1100/70 and the system console(s). The minimum system console consists of a Uniscope 200 Display Terminal with alphanumeric keyboard, 200 cps bidirectional printer, a

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TABLE 2. MASS STORAGE

Subsystems	FH-432/ FH-1782 Drums	8407 Diskette	8430/8433 Disks	8434 Disk	8450 Disk	8470/8480 Disks
Cabinets per subsystem	1 to 8	1 or 2	2 to 32	1 to 16	2 to 32	2-32/1-8
Disk packs/HDAs per cabinet	—	1	1 removable	1 fixed	1 HDA	1 HDA/4 HDAs
Capacity						
Bytes*	1.17M/9.4M	Up to 1.0M	77M/154M	243.8M	243.3M	403M/1612M
Words*	256K/2048K	—	17M/34M	54M	54M	89.6M/384.4M
Tracks/segments per drive unit	384/1536	77 to 154 per diskette	7,809/15,485	16,682	16,800	20,160/80,000
Average access time, milliseconds	4.3/17.0	175	27/30	30	23	23
Average rotational delay	—	83.3	8.3	8.3	8.3	8.3
Data transfer rate:						
Bytes/second	1,080,000	62,000 max.	806,000	1,257,000	1,260.000	2,097,000
Words/Second	240,000	—	179,111	279,333	280,000	466,000
Controller model	5012-99	Integrated	5039	5046	5046	5056
Comments	Models FH-432 and FH-1782 can be intermixed on same system.	Available with manual or autoload; autoload accommodates up to 20 diskettes.	Can be intermixed with other 8400 Series drives.	Can be intermixed with other 8400 Series drives.	Can be intermixed with other 8400 Series drives.	Both models can be intermixed with other 8400 Series drives.

*Using 112-word records.

Overall, the Sperry system performed according to specifications. In discussing system drawbacks, he commented on some difficulties encountered while implementing Fortran-77. Specifically, sporadic problems would occur with the Fortran optimizer that stumped the Sperry software support team yet had been resolved by in-house programmers. He also identified the absence of a symbolic debugger for Fortran as another disadvantage. However, he also stressed that in terms of hardware, there were no complaints on a reliability and ease of operation issue. □

control panel, and a stand. 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.

ATTACHED VIRTUAL PROCESSOR (AVP): The AVP is a special-purpose processor that provides a migration path from the byte-oriented Series 90/60 and 90/80 systems to the word-oriented 1100/70 systems. The AVP can be attached to any processor model in the 1100/70 family except Model B1. Performance is comparable to the 90/80-3. The AVP provides concurrent execution of applications written for the VS/9 operating system and applications written for the 1100 Series operating system.

The AVP incorporates system features found in both Series 90 and 1100/70 processors. On the VS/9 side, the hardware includes a CPU with a logic bus structure and microcode control similar to the 90/80 family. In addition, the reliability features of the 90/80, such as parity checking, control store, and duplicate adders, have been maintained and applied to the AVP. The 1100/70 System Support Processor (SSP) is also included, and provides partitioning, system control, maintenance, and console management functions.

The system's main memory ranges from 512K words (2 megabytes) to 1024K words (4 megabytes). An 8K word (32K-byte) cache unit provides buffer storage of instructions and data between the 1100 Main Storage Unit (MSU) and the AVP CPU. The cache is designed to improve CPU performance while reducing the number of requests into the MSU.

I/O operations are handled by the AVP using the Attached Processor Control Software (APCS). The AVP can accommodate VS/9 random access data files via direct, logical, or local attachment. The Direct Attachment feature permits disk subsystems of the Series 90 systems to attach directly to the 1100/70 block multiplexer channel. Files written for VS/9 can be run on the AVP without change. The Logical Attachment facility permits the VS/9 user to utilize current technology random access devices, such as the 8470 disk drive, that are not included in standard VS/9 configurations. The third access mode, Local Attachment, permits devices available for VS/9 operation, but not for OS 1100, to be run on the AVP. The devices are attached to an optional block multiplexer channel.

Several VS/9 software products have been modified for use in the 1100 Series. These products are IMS 1100, based on the IMS/90 transaction processing system; the Interactive Processing Facility 1100; a full-screen display text editor called EDIT 1100; the Programmers Advanced Debugging System, PADS 1100; and an industry compatible RPG II compiler.

INPUT/OUTPUT CONTROL

I/O CHANNELS: All models in the 1100/70 family contain one Input/Output Unit (IOU). The IOU consists of a central control module (CCM) and up to six channel modules. The CCM provides independent control paths to up to two CPUs and up to two SSPs and data paths to/from up to two MSUs and the channel modules. The CCM processes all I/O instructions, passes control information to the channel modules, controls main storage requests, updates control words and format status words, and generates all interrupt requests.

Each channel module consists of either one block multiplexer channel or four word channels. The basic IOU contains one word channel module and one block multiplexer channel. A fully configured IOU can consist of 2 block multiplexer channels and 12 word channels, 3 block multiplexer

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TABLE 3. INPUT/OUTPUT UNITS

Magnetic Tape Units	Number of Tracks	Recording Density, Bits/Inch	Encoding	Tape Speed Inches/Sec.	Transfer Rate, Bytes/Sec.
Uniservo 22	9 9	800 1600	NRZI PE	75 75	60,000 120,000
Uniservo 24	9 9	800 1600	NRZI PE	125 125	100,000 200,000
Uniservo 26	9 9	1600 6250	PE GCR	75 75	120,000 470,000
Uniservo 28	9 9	1600 6250	PE GCR	125 125	200,000 780,000
Uniservo 30	7	200/556/ 800	NRZI	200	40,000/111,200/ 160,000
Uniservo 30	9 9	800 1600	NRZI PE	200 200	160,000 320,000
Uniservo 32	9 9	1600 6250	PE GCR	75 75	120,000 470,000
Uniservo 34	9 9	1600 6250	PE GCR	125 125	200,000 780,000
Uniservo 36	9 9	1600 6250	PE GCR	200 200	320,000 1,250,000
Printers	**Printing Speed**	**Print Positions**	**Horizontal Spacing, Chars./Inch**	**Vertical Spacing, Lines/Inch**	**Form Size, Inches**
0770-00 0770-02 0770-04	800 lpm 1400 lpm 2000 lpm	132 132 132	10 10 10	6 or 8 6 or 8 6 or 8	3.5 to 22 in. wide, 24 in. long
0776-00 0776-02 0776-04	760 lpm 900 lpm 1200 lpm	136 136 136	10 10 10	6 or 8 6 or 8 6 or 8	4.0 to 18.75 in. wide, 24 in. long
0777 Laser Printer	10,500 to 21,000 lpm	136, 163, or 204	10, 12, or 15	6, 8, or 12	6.5 to 15.8 in. wide, 8 to 14 in. long
Punched Card Equipment	**Columns**	**Speed Cards/Min.**	**Input Hopper Capacity**	**Output Stacker Capacity**	**Options**
0716 Card Reader	80	1000	2400	Two 2000-card stackers	51- or 66-col. cards, validity checks, alternate stacker, dual translate
0604 Card Punch	80	250	1000	Two 1000-card stackers	—

channels and 8 word channels, or 5 block multiplexer channels and 4 word channels.

Individual word channels operate in one of three modes: 36-bit Internally Specified Index (ISI), 18-bit Externally Specified Index (ESI), or 9-bit ESI. The ISI mode word channel has one subchannel assignment. The ESI mode word channel has up to 64 subchannels, while the block multiplexer channel has up to 128 subchannels for concurrent operation. Each IOU can support up to 1024 subchannels. One subchannel is reserved for the status table, leaving 1023 for use by the system.

The maximum block multiplexer channel data rate is 1.67 million bytes per second. The aggregate output data rate for a word channel module (four channels) operating in ISI mode is 615K words per second. The aggregate input data rate for a word channel module is 718K words per second in ISI mode.

SIMULTANEOUS OPERATIONS: One input or output operation on each I/O channel can occur simultaneously with computation in each processor. Moreover, the Externally Specified Index (ESI) mode permits multiple remote communications devices to transmit data to and from main

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storage in multiplexed fashion over a single I/O channel. All installed processors and IOUs can operate simultaneously and independently, with interference occurring only when two or more of these units simultaneously attempt to access the same storage module.

The microinstruction execution units utilize overlap execution techniques, with one new microinstruction starting each cycle.

CONFIGURATION RULES

The 1100/71 unit processor systems are available in seven basic processor models. The entry-level B model and the C models do not include buffer storage. The E models include 2K words (8K bytes) of buffer storage, while the H models include 8K words (32K bytes) of buffer storage. Models B1, C1, E1, and H1 include the standard 1100 Series instruction set. Models C2, E2, and H2 include the extended instruction set, which is designed to enhance the performance of high-level languages and system software.

All 1100/71 systems include one central processor, 512K words (2 megabytes) of main memory, one I/O Unit (IOU), one System Support Processor (SSP), a system console with printer, and an entry-level cache/disk control. Main memory is expandable in 512K word increments to a maximum of 4096K words (16 megabytes). A second IOU and up to three auxiliary consoles can be added.

The 1100/70 dual processor systems are available in Models E and H only. The 1100/70 systems include two central processors, 512K words of main memory per processor, one IOU, one SSP, a system console with printer, a maintenance console, and two entry-level cache/disk controls. Main memory is expandable in 512K word increments to a maximum of 4096K words per processor for a total of 8192K words (32 megabytes). A second IOU and up to five auxiliary consoles can be added.

The 1100/72 systems (Models E and H only) are fully redundant multiprocessor systems that include two central processors, 512K words of main memory per processor, two IOUs, two SSPs, two system consoles with printers, a maintenance console, and two entry-level cache/disk controls. Each processor can have up to 4096K words of main memory for a total system capacity of 8192K words. Two additional IOUs can be added, one per processor. The 1100/72 systems support up to six auxiliary consoles.

The 1100/73 and 1100/74 multiprocessor systems (H Models only), consist of additional central processor complexes that can be added to the 1100/72 H Models. The 1100/73 system comprises three Model H1 or H2 processors with a total of 24K words of buffer storage, two or three Input/Output Units (IOUs), and two System Support Processors (SSPs). The 1100/74 processor complex includes four Model H1 or H2 CPUs with a total of 32K words of buffer storage, two or four IOUs, and two SSPs. Both systems support 1024K words to 8192K words of main memory. In addition, both systems support up to six auxiliary consoles. A multiprocessor system requires two consoles and one maintenance CRT/keyboard. The maintenance CRT/keyboard connects to one of the auxiliary console interfaces on each System Support Processor.

Minimum peripheral equipment required to complete an 1100/70 series system includes an 0776 Printer Subsystem, a disk subsystem with one 5057 Control Unit and one disk drive, a magnetic tape subsystem with one control unit and two Uniservo 22 or 24 Magnetic Tape Units, and a Telcon system with one DCP.

As an alternative, a minimum peripheral system would include an 0770 Printer Subsystem, a disk subsystem with one control unit and one disk drive, and a magnetic tape subsystem with one control unit and two Uniservo 30, 32, 34, or 36 Magnetic Tape Units.

No maximum peripheral restrictions are placed on the 1100/70 series configurations other than channel considerations (see Input/Output Control). However, some peripheral subsystems used on earlier Sperry 1100 Series Systems can only be configured with present software support. Sperry will not enhance any of the existing 1100 Series software for these subsystems.

MASS STORAGE

Disk and diskette subsystems supported on the 1100/70 series are listed in Table 2.

CACHE/DISK SYSTEM: A hierarchical mass storage system that provides a level of memory between the 1100/70 series processor and 8450, 8470, or 8480 disk drives. The Cache/Disk System consists of one or two 5057 Cache/Disk Controls, up to four 7053 Storage Units, and up to eight 8450, eight 8470, or two 8480 disk units (16 drives maximum). The 5057 can also be used as a conventional disk controller and must be used in this mode on the 1100/71 Model B1.

The 5057 Cache/Disk Control manages 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 solidstate 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 Solidstate 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 Solidstate 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 (302 million bytes). 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).

Also available is the Semiconductor Auxiliary Storage (SAS) Processor, which manages up to four 7053 Cache Storage Units used exclusively in solidstate disk mode. The SAS can be upgraded to a cache/disk processor.

INPUT/OUTPUT UNITS

Magnetic tape drives, printers, and punched card equipment for the 1100/70 series are listed in Table 3.

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COMMUNICATIONS CONTROL

DCP/TELCON: Telcon is an intelligent communications system that provides basic hardware, software, and peripherals for users with large communications networks. The system can operate as a front-end processor for 1100/70 and other 1100 Series host processors, as a network nodal processor, or as a remote concentrator. As such, it provides networks that support realtime, 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.

Three DCP models are now available: the DCP/10, DCP/20, and DCP/40. The entry-level DCP/10 includes a processor, 512K bytes of memory, and communications line modules. Available peripherals include hard disk and flexible disk subsystems. The DCP/10 supports 8 half- or full-duplex communications lines.

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 and first I/O processor perform both generalized communications processing and input/output processing; the additional I/O processors perform input/output processing only. Peripherals supported include hard disk subsystems, flexible disk subsystems, and magnetic tape subsystems. The DCP/20 supports up to 48 half- or full-duplex communications lines.

The DCP/40 system includes a processor, from 512K to 2048K bytes of memory, up to 16 I/O processors, and communications line modules. With the addition of an expansion cabinet, main memory can be increased to a total of 3.5 megabytes. Available peripherals include hard disk subsystems, flexible disk subsystems, and magnetic tape subsystems. The DCP/40 supports up to 256 half- or full-duplex communications lines.

The DCP/10 has 8 communications ports, while the DCP/20 and DCP/40 support up to 16 ports per I/O processor. The DCPs can handle a combination of serial lines to remote equipment, channels to peripheral devices, or channels to on-site host Series 1100 or, on the DCP/20 and DCP/40, Series 90 processors. Each operational port requires one line module, which provides an interface to a line and performs various communications functions such as control character recognition and line timing. The multiline asynchronous line module multiplexes four circuits onto one port; all other communications line modules terminate one line per port. All DCPs accommodate asynchronous, synchronous, and wideband transmission at up to 64K bits per second. They support Universal Data Link Control as well as character-oriented communications protocols.

The DCPs 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 terminal devices, as well as several non-Sperry 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.21 circuit and X.25 packet switching public data networks.

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

GENERAL COMMUNICATIONS SUBSYSTEM (GCS): The GCS enables an 1100/70 series system to receive and transmit data via any common carrier. It can accommodate up to 32 half- or full-duplex communications lines at speeds of up to 56,000 bits per second, under direct program control of the central processor. The GCS consists of a Communications Terminal Controller that connects to a processor ESI I/O channel and acts as a multiplexer to from 1 to 32 Communications Terminals and Communications Interfaces. Each Communications Terminal/Communications Interface combination can accommodate one half-duplex or one full-duplex line. Transmission is in asynchronous or synchronous bit-serial mode, using codes of 5, 6, 7, or 8 levels. The asynchronous interfaces can handle speeds ranging from 45.45 to 2400 bits per second, while the synchronous interface can handle line speeds of up to 56,000 bits per second. In addition to the bit-serial interfaces, an automatic dial interface is available.

TERMINALS: The following Sperry 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 terminals, the UTS 400 terminals, the UTS 4000 Series terminals, the System 80 computer, and the BC/7 and V77 minicomputers. Support for IBM's binary synchronous communications protocol also permits transfer of data between IBM System/370 and Sperry 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, realtime, and interactive processing in multiprogramming, multiprocessing, and distributed processing environments. 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.)

Realtime and communications programs, which are subject to specific time constraints, receive top-priority handling by the 1100 Operating System. Realtime 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 realtime 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.

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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 interprocessor 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 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 data base, 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 1100/70 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 or auxiliary storage; this common data pool is then accessed by the Transaction 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 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 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.

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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 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-Sperry terminals, processors and networks, and the flexible modularity of the existing Sperry 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. 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 nonswitched, 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 data base 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) data base 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 data base via DMS 1100. The Data Management Routine, the key operational component of DMS 1100, maintains the data base and preserves its integrity. The Data Reorganization Utility provides for optimization of the physical placement of records within an existing data base without the need for tailored unload and reload programs.

PCIOS is designed to assure compatible data file formats. It supports sequential, indexed sequential, and multikeyed 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 data bases are defined by the data manipulation language used for retrieval and updating of data. The Relational Translation Language provides relational views of other data bases, such as DMS 1100.

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

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 Administration System* is a functional successor to Sperry'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), Transaction Performance Auditing System (TPAS), 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 mes-

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sage, 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 reentrant. 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 setting priorities for messages and other special message manipulation.

TPAS provides the TIP user with accounting and performance measurement tools. TPAS generates reports for transactions, data base management, and message management.

IMS 1100 is an interactive transaction processing system compatible with the IMS 90 used on the Sperry 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 multipage 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 realtime 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 file 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 data bases and related report processing and generating services without applications programming. *Mapper Graphics* is an extension of Mapper that provides graphics capabilities on Uniscope-compatible terminals.

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 data bases.

QLP 1100 is an English-language inquiry system that allows inquiries to be made to data bases 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 data base 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 data base, are both reentrant. Through the use of the QLP command languages, users can inquire into the data base, 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 data base 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 data base 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, and 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.

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 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

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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 reentrant and produces reentrant 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: data base 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 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 reentrant 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 reentrant 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 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 to the minus 308th power to 10 to the 308th power 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, reentrant, common-banked compiler that provides for extensive optimization, generates reentrant 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 also offers a reentrant 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 reentrant, 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'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'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 reentrant capability enables multiple time-sharing terminals to use the compiler simultaneously. The system need not be dedicated exclusively to Basic operations.

The 1100 Series *PL/1 compiler* is Sperry'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 reentrant run-time support routines complements the reentrant 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 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).

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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 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 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 online, realtime 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 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)

MVAP (Mean Value Approximation Package)

OPTIMA 1100 (Project Management System)

Sperry Calc 1100

SUFICS 1100 (Sperry Financial Integrated Control System)

UNIDAS 1100 (Information Storage and Retrieval)

UNIDIS TRANS (Motor Freight System)

UNIDIS WHOLESALE (Warehouse Management)

UNIFACS 1100 (Financial Systems)

UNISCAD (Computer Aided Design)

UNIS 1100 (Industrial Systems); includes Bill of Materials Processor, Inventory Control, and Planning and Scheduling

USAS (Standard Airline System)

PRICING AND SUPPORT

The 1100/70 is available for purchase or on a one-year, five-year, or six-year lease. Third-party leases are also available. All software except the operating system is unbundled. On-site Local Support Service (previously called Extended Support Service) for operating system support can be obtained for a flat monthly fee. Sperry also offers a seven-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 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	15	—	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 additional hour	132	150

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

TRACE: Sperry has initiated a remote hardware maintenance concept through its facility in Roseville, Minnesota. The Total Remote Assistance Center (TRACE) is available to 1100/70 system customers via a dedicated WATS number 24 hours per day and 7 days per week. Via TRACE, a user's system may be monitored and controlled using on-site and remote library testing programs. TRACE also provides support for a wide range of Sperry 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

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operate properly, and can be utilized for comparison purposes during diagnostic testing.

EQUIPMENT: The following systems illustrate some of the configurations that are possible within the Sperry 1100/70 Systems. All use the 1100 Operating System. All necessary control units and adapters are included in the indicated prices. Quoted lease prices do not include equipment maintenance charges.

1100/71 MODEL B1 SYSTEM: Includes Processing Complex (CPU with 512K words of main memory, System Support Processor, System Console, I/O Unit with one block multiplexer channel and one word channel module, and 5057-95 Cache/Disk Control) plus two 8450 Fixed-Disk Drives (486.6 million bytes), two Uniservo 30 Magnetic Tape Drives with controller, and a 1400 lpm 0770 Printer. The purchase price is $394,122, the monthly charge on a one-year lease is $12,307, and monthly maintenance is $2,804.

1100/70 E1 DUAL PROCESSOR SYSTEM: Includes Processing Complex (two CPUs with 512K words of main memory each and a total of 16K words of buffer storage, one System Support Processor, one System Console, one Maintenance Console, I/O Unit with one block multiplexer channel and one word channel module, and two 5057-95 Cache/Disk Controls) plus two additional memory units for a total of 2048K words of main memory, two 8480 Fixed-Disk Drives (3.2 billion bytes), six Uniservo 26 Magnetic Tape Drives with controller and dual channel feature, two 1200 lpm 0776 Printers, and a DCP/20 system with 6 communications lines. The purchase price is $996,625, the monthly charge on a one-year lease is $29,855, and monthly maintenance is $6,764.

1100/72 H2 MULTIPROCESSOR SYSTEM: Includes Processing Complex (two CPUs with Extended Instruction Set, 512K words of main memory per CPU, a total of 16K words of buffer storage, two System Support Processors, two System Consoles, one Maintenance Console, two I/O Units with one block multiplexer channel and one word channel module each, and two 5057-95 Cache/Disk Controls) plus six additional memory units for a total of 4096K words of main memory, two 8480 Fixed-Disk Drives (3.2 billion bytes), eight Uniservo 28 Magnetic Tape Drives with controller and dual channel feature, four 1200 lpm 0776 Printers, and a DCP/20 system with six communications lines. The purchase price is $1,497,995, the monthly charge on a one-year lease is $46,125, and monthly maintenance is $9,330.

1100/74 H2 MULTIPROCESSOR SYSTEM: Includes Processing Complex (two CPUs with Extended Instruction Set, one 7049 Memory Storage Unit with 512K words of main memory per CPU, a total of 16K words of buffer storage, Two System Support Processors, two System Consoles, one Maintenance Console, two I/O Units with one block multiplexer channel and one word channel module each, and two 5057-95 Cache/Disk Controls) plus two H2 Processor Expansion Units for expanding an 1100/72 H2 configuration to an 1100/74, an I/O Expansion Unit, an additional free-standing MSU cabinet which houses up to 4194K words, four additional memory units for a total of 4096K words of memory, four 8480 fixed disk drives, twelve Uniservo 28 Magnetic Tape Drives with controller and dual channel feature, four 2000 lpm 0770-04 Printers, and a DCP/20 system with eight communications lines. The purchase price is $5,753,377, the monthly charge on a one-year lease is $83,644, and monhtly maintenance is $17,097.

EQUIPMENT PRICES

		Purchase Price ($)	Monthly Maint. ($)	Monthly Charges* 1-Year Lease ($)	Monthly Charges* 5-Year Lease ($)
PROCESSORS					
3092-23	1100/71 Model B1 Entry-Level Processing Complex; includes CPU with standard instruction set, 512K words of main memory, IOU with one block multiplexer channel and one word channel module (4 channels), System Support Processor (SSP), system console with printer, and entry-level cache/disk control	188,000	1,070	5,250	4,200
3092-99	1100/71 Model C1 Standard Processing Complex; includes CPU with standard instruction set, 512K words of main memory, IOU with one block multiplexer channel and one word channel module (4 channels), SSP, system console with printer, and entry-level cache/disk control	234,720	1,420	7,165	5,735
3092-96	1100/71 Model C2 Standard Processing Complex; same as Model C1, but with extended instruction set	263,120	1,545	8,215	6,575
3092-75	1100/71 Model E1 Medium Performance Processing Complex; includes CPU with standard instruction set, 512K words of main storage, 2K words of buffer storage, integrated multiprocessor capability, IOU as in Model C1, SSP, maintenance console, and system console and cache/disk control as in Model C1	280,620	1,770	8,940	7,155
3092-72	1100/71 Model E2 Medium Performance Processing Complex; same as Model E1, but with extended instruction set	309,020	1,895	9,990	7,995
3092-93	1100/71 Model H1 High Performance Processing Complex; same as Model E1, but with 8K words of buffer storage	325,620	2,120	10,580	8,470
3092-90	1100/71 Model H2 High Performance Processing Complex; same as Model H1, but with extended instruction set	354,020	2,245	11,630	9,310
3092-61	1100/70 Model E1 Medium Performance Dual Processor Complex; includes two CPUs with 512K words of main memory each, 2K words of buffer storage per CPU, one IOU, one SSP, one system console with printer, one maintenance console, and two cache/disk controls	468,490	3,340	15,170	12,145
3092-60	1100/70 Model E2 Medium Performance Dual Processor Complex; same as 3092-61, but with extended instruction set	525,290	3,590	17,270	13,825

**Lease prices do not include maintenance.*

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		Purchase Price ($)	Monthly Maint. ($)	Monthly Charges* 1-Year Lease ($)	Monthly Charges* 5-Year Lease ($)
PROCESSORS (Continued)					
3092-59	1100/70 Model H1 High Performance Dual Processor Complex; includes two CPUs with 512K words of main memory each, 8K words of buffer storage per CPU, one IOU, one SSP, one system console with printer, one maintenance console, and two cache/disk controls	558,490	4,040	18,450	14,775
3092-58	1100/70 Model H2 High Performance Dual Processor Complex; same as 3092-59, but with extended instruction set	615,290	4,290	20,550	16,455
3092-57	1100/72 Model E1 Medium Performance Multiprocessor Complex; includes two CPUs with 512K words of main memory each, 2K words of buffer storage per CPU, two IOUs, two SSPs, two system consoles with printers, one maintenance console, and two cache/disk controls	561,240	3,540	17,880	14,310
3092-68	1100/72 Model E2 Medium Performance Multiprocessor Complex; same as 3092-57, but with extended instruction set	618,040	3,790	19,980	15,990
3092-56	1100/72 Model H1 High Performance Multiprocessor Complex; includes two CPUs with 512K words of main memory each, 8K words of buffer storage per CPU, two IOUs, two SSPs, two system consoles with printers, one maintenance processor, and two cache/disk controls	651,240	4,240	21,160	16,940
3092-65	1100/72 Model H2 High Performance Multiprocessor Complex; same as 3092-56, but with extended instruction set	708,040	4,490	23,260	18,620
3092-67	1100/72 Model H1 High Performance Multiprocessor Complex; to be used when initially ordering and 1100/73 or 1100/74; includes two CPUs with 8K words of buffer storage each, one Memory Storage Unit with 1024K words of main memory, two IOUs, two SSPs, two system consoles, one maintenance console, and two entry-level cache/disk controls	783,240	4,540	24,472	19,615
3092-64	1100/72 Model H2 High Performance Multiprocessor Complex; same as 3092-67, but with Extended Instruction Set	840,040	4,790	26,572	21,295
3092-79	Model H1 Processor Expansion; provides and H1 processor for expanding an 1100/72 H1 to an 1100/73 H1 or for expanding an 1100/73 H1 to an 1100/74 H1; includes one processor with 8K-word buffer; external main memory must be ordered separately	185,120	1,730	5,835	4,700
3092-78	Same as 3092-79, but for H2 systems; includes Extended Instruction Set	213,520	1,855	6,885	5,540
3064-99	Attached Virtual Processor (AVP); includes CPU with 512K to 1024K words of main memory and 32K-byte buffer; main storage interface unit; interprocessor interface; one byte multiplexer channel; one externally specified index attachment; VS/9 facility; AVP console; and Attached Processor Control Software (not available for B1 processors)	132,040	455	2,669	2,357
F3627-00	AVP Block Multiplexer Channel	16,430	60	390	310
SYSTEM UPGRADES					
K3919-97	Model B1 to C1 Upgrade	46,720	350	1,915	1,535
F2917-99	Model 1 up 2 Upgrade; makes Model C1, E1, or H1 into the equivalent of Model C2, E2, or H2 with the addition of the Extended Instruction Set	28,400	125	1,050	840
1952-86	Model Upgrade; upgrades 1100/71 C1 to E1 or C2 to E2	45,900	350	1,775	1,420
1952-84	Model upgrade; upgrades 1100/72 C1 to H1 or C2 to H2	90,900	700	3,415	2,735
1952-82	Model Upgrade; upgrades Model E1 to H1 or E2 to H2	45,000	350	1,640	1,315
3092-55	Model E1 Dual Processor Upgrade; upgrades 1100/71 E1 to 1100/70 E1 by adding second E1 processor with 2K-word buffer and 512K-word memory	166,690	1,430	5,530	4,460
3902-54	Model E2 Dual Processor Upgrade; same as 3902-55, but adds E2 to E2	195,090	1,555	6,580	5,300
3092-53	Model H1 Dual Processor Upgrade; upgrades 1100/71 H1 to 1100/70 H1 by adding second H1 processor with 8K-word buffer and 512K-word memory	211,690	1,780	7,170	5,775
3092-52	Model H2 Dual processor Upgrade; same as 3092-53 but adds H2 to H2	240,090	1,905	8,220	6,615
3092-51	Model E1 Dual Processor Upgrade; same as 3092-55 but includes additional entry-level cache/disk control	187,870	1,570	6,230	4,990
3092-50	Model E2 Dual Processor Upgrade; same as 3092-54, but includes additional entry-level cache/disk control	216,270	1,695	7,280	5,830
3092-87	Model H1 Dual Processor Upgrade; same as 3092-53 but includes additional entry-level cache/disk control	232,870	1,920	7,870	6,305
3092-85	Model H2 Dual Processor Upgrade; same as 3092-52, but includes additional entry-level cache/disk control	261,270	2,045	8,920	7,145
2003-99	1100/70 Dual Processor to 1100/72 Multiprocessor Upgrade; includes one IOU, one SSP, and one system console with printer	92,750	200	2,710	2,165
PROCESSOR OPTIONS					
F2869-00	Performance Monitor; provides scannable buffered counters within a processing complex to allow the System Support Processor to collect selected performance parameters; one required per complex	32,151	23	803	637
F2688-00	IOU Expansion; provides space for up to two word channel modules and one block multiplexer channel; one per processor complex; mutually exclusive with F2916-00	8,722	23	271	216
F2916-00	IOU Expansion; provides space for up to two block multiplexer channels and one word channel module; one per processor complex; mutually exclusive with F2688-00	8,722	23	271	216
F3751-00	IOU Expansion; provides space for four additional block multiplexer channels; one per processor complex; mutually exclusive with F2688-00 and F2916-00	16,500	75	472	367
2003-97	I/O Expansion for 1100/73 and 1100/74 systems; includes interfacing logic for two CPU/IOU interfaces, two MSUs, support controller interface, one block multiplexer channel and one word channel module	45,000	180	1,395	1,120

**Lease prices do not include maintenance.*

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		Purchase Price ($)	Monthly Maint. ($)	Monthly Charges* 1-Year Lease ($)	Monthly Charges* 5-Year Lease ($)
PROCESSOR OPTIONS (Continued)					
F2684-00	Word Channel Module; provides four additional independent word channel interfaces; for use with F2688-00 and F2916-00	17,425	105	515	410
F2690-00	Block Multiplexer Channel; provides interface for up to eight byte-oriented control units; for use with F2688 or F2916	13,867	70	433	343
F2690-01	Block Multiplexer Channel; same as F2690-00, but also for use in F3751-00	13,867	70	433	343
F2867-00	Shared Peripheral Interface (SPI) Control; provides capability to control up to six word control units, each with up to four SPI interfaces	16,105	23	404	321
F2904-00	Byte Channel Transfer Switch Control; provides capability to control one fully configured 4 by 8 byte channel transfer switch; maximum of 2 F2867-00 or F2904-00 per processing complex	16,105	23	404	321
2521-00	Channel Transfer Switch for block multiplexer channels; free-standing cabinet contains operator controls for manual switching of 4 subsystem strings, a primary module with 2x1 switch, and power and space for 4x8 switching	19,781	81	489	365
2521-02	Channel Transfer Switch for remote operation	19,781	81	489	365
F2600-00	Primary Module Expansion; adds a switch for one subsystem string; maximum of 3 per 2521-00 or F2601-00; maximum of one per F2601-01	586	—	14	11
F2601-00	Additional Primary Module; adds a second 2x1 primary module and operator control for switching up to 4 subsystem strings	10,476	44	273	194
F2601-02	Additional Primary Module for remote operation	10,476	44	273	194
F2601-01	Secondary Module; for applications requiring 2-by switching capability when up to 4 switchable strings can be configured among independent 2-by switches; may be expanded by one F2600-00	10,476	44	273	194
F2601-03	Secondary Module; same as F2601-01 but for remote operation	10,476	44	273	194
F2602-00	Secondary Module; expands primary module from 2x1 to 4x1; two maximum	7,127	34	185	133
F2602-01	Secondary Module; same as F2602-00 but for remote operation	7,127	34	185	133
F2603-00	Secondary Module; allows expansion of 4-by switching by one subsystem string; maximum of 3 with each F2602-00; requires F2600-00	586	—	14	11
F2604-00	DC Power Redundancy; adds back-up DC supplies for hot-standby dynamic power redundancy	2,680	13	69	49
3660-64	Additional Console Complex; attaches to SSP; includes CRT console with keyboard, 200-cps bidirectional printer, and console table; maximum of two per SSP	28,627	129	714	565
3660-62	Auxiliary Console; includes CRT console with keyboard and console table; maximum of two per processor complex	11,574	70	288	227
MEMORY					
K3368-98	Memory Storage Unit Expansion; provides an additional 512K words of memory; maximum of 4096K words for a unit processor and 8192K words for a dual processor or multiprocessor	24,320	50	855	685
7049-92	Main Storage Unit Cabinet; houses from 1024K to 4096K words of external memory for 1100/73, 1100/74, 1100/72 AVP, or 1100/73 AVP systems	132,000	300	3,312	2,675
7049-91	Main Storage Unit Cabinet Expansion; provides second cabinet for external memory for 1100/73 or 1100/74; includes cabinet with a maximum of 4096K words	180,640	400	5,022	4,045
2004-98	Storage Expansion; provides 1024K words of external memory for 7049 MSU, which is prerequisite	48,640	100	1,710	1,370
MASS STORAGE					
5012-99	FH-432/FH-1782 Drum Control; controls one to eight 6016-00 or 6015-00 drums in any combination	102,720	555	2,247	1,605
F0929-00	Write Lockout Feature for 5012-99 drum control	1,392	5	32	22
F0930-99	Shared Peripheral Interface for 5012-99 drum control; multiprocessor application only	22,608	52	495	355
6016-00	FH-432 Drum; 256K words	52,848	229	1,271	825
6015-00	FH-1782 Drum; 2048K words	146,064	638	3,512	2,280
F0786-01	Dual Channel Feature for 6016-00 drum	3,024	31	72	47
F0767-00	Dual Channel Feature for 6015-00 drum	3,024	35	69	47
8407-00	8407 Diskette Subsystem; includes control unit and auto-load diskette drive; stores up to 20 one-megabyte diskettes	22,000	164	540	433
8407-02	8407 Diskette Drive; requires 8407-00	6,000	44	181	139
F3470-00	Translate Table; performs character translation; 512 bytes	3,640	19	109	82
5039-91	8433/8430 Control for up to eight 8430 or 8433 disk drives; minimum two disk drives per subsystem	27,000	408	1,577	769
F2047-00	Drive Expansion Feature for the 5039-91; provide for up to 16 8433/8430 drives to be attached to the 5039-91	5,760	56	211	137
8430-99	8430 Disk Drive; removable disk media; minimum of two drives per system	9,360	177	547	266
F1230-00	Disk Pack for the 8430-99; 17 million words	1,440	—	53	35
8433-00	8433 Disk Drive; removable disk media; minimum of two drives per system	13,680	258	798	389
F1223-00	Disk Pack for the 8433-00; 34 million words	1,820	—	66	43
F2342-00	Disk Drive Upgrade; converts 8430-99 to 8433-00	4,320	82	251	123
F2021-00	8433/8430 Dual Access Feature; provides dual access and simultaneous read/read, read/write, write/read, or write/write on any two 8433-00 or 8430-99	1,630	5	59	39

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		Purchase Price ($)	Monthly Maint. ($)	Monthly Charges* 1-Year Lease ($)	Monthly Charges* 5-Year Lease ($)
MASS STORAGE (Continued)					
5046-99	8430/8433/8434 Control; controls up to 16 8430, 8433 or 8434 disk drives; maximum 866M words of storage; requires minimum of two disk drives	38,250	555	2,525	1,231
5046-97	8430/8433/8434 Dual Control; for dual-access subsystem operation; requires two channels	66,168	969	4,571	2,228
8434-99	8434 Disk Storage; provides two single-spindle disk drives with non-removable pack; 54.18M words per drive	66,600	314	2,439	1,583
F2561-00	32-Device Capability; allows up to thirty-two 8430, 8433, or 8434 disk drives to be intermixed on one 5046-99 control; two required for 5046-97 dual control	7,680	56	211	137
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	2,688	19	64	48
F2555-00	Shared Peripheral Interface; provides an additional I/O interface for the 5046-99/97 controls	6,600	40	158	117
5046-95	8430/8433/8450 Control; provides control for 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 of the same type	51,000	555	2,462	1,231
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	88,224	969	4,334	2,228
F2838-00	8450 Capability Expansion; allows 5046-95 control to handle up to 32 8450 disk drives; requires F2837-00 power control expansion (excludes use of F2720-00 8430/8433 capability)	6,000	62	171	114
F2720-00	8430/8433 Capability Expansion; allows 5046-95 control to handle up to 16 8430 or 8433 disk drives (excludes use of F2838-00 8450 capability)	2,400	13	68	48
F2837-00	Power Control Expansion; required when total number of disk drives exceeds 16; two required for 5046-93 dual control	6,575	56	222	144
F2555-00	Shared Peripheral Interface; multiprocessor; allows 5046-95 to connect to two separate 1100 Series processors; two required for 5046-93 control	6,600	40	158	117
8450-99	8450 Disk Storage; provides two disk drives using non-interchangeable data module; 54M words of storage per drive	49,950	346	2,439	1,583
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	2,304	19	64	48
5056-83	8470/8480 Disk Control	43,750	258	1,255	930
F2994-00	Four Channel Capability for 5056-83	6,472	37	188	138
F3192-00	8430/8433 Attachment; allows up to eight 8430/8433 drives on 5056 control unit; up to three are allowed	9,840	58	305	226
F3192-01	8450 Attachment; allows up to eight 8450 drives on 5056 control unit; up to three are allowed	9,840	58	305	226
F3192-02	8470/8480 Attachment; allows up to eight additional 8470 or two 8480 drives on single control unit; up to three are allowed	3,200	21	105	78
F2837-00	Power Control Expansion; required on control unit when over 16 drives are configured	6,575	56	222	144
F3193-00	32-Drive Addressing	1,280	4	38	27
8470-99	8470 Disk Drive; 89.6M words of storage	27,360	119	809	599
F2718-00	8470 Dual Access Feature; provides dual access and simultaneous read/write, read/read, write/read, and write/write	1,920	17	57	42
8480-99	8480 Disk Storage Unit; contains 4 spindles with a total capacity of 384.4M words; includes dual-access feature	83,700	497	2,113	1,761
8480-97	8480 Disk Storage Unit; same as 8480-99, but without dual access	76,500	475	1,932	1,607
F2718-02	8480 Dual-Access Feature; provides dual access and simultaneous read/write, read/read, write/read, and write/write	7,200	22	181	154
5057-95	Entry-Level Cache/Disk Control; manages up to four 7053 Cache Storage units and up to eight 8450/8470 or two 8480 disk units; 16 drives maximum	52,960	355	1,770	1,324
5057-97	Dual Medium Performance Cache/Disk Controls; dual access features required in disk units and 7053 units	105,920	710	3,540	2,648
5057-93	Dual High Performance Cache/Disk Controls; dual access features required in disk units and 7053 units	168,400	710	5,590	4,210
F3948-98	High Performance Upgrade; upgrades 5057-97 to 5057-93	62,480	—	2,050	1,562
F3567-00	8450 Capability Expansion; permits sixteen 8450 drives on cache/disk control; precludes 8470 drives	9,345	55	290	215
F3568-00	8470/8480 Capability Expansion; permits sixteen 8470 drives or four 8480 drives on cache/disk control; precludes 8450 drives; two required for dual processors	9,345	55	290	215
F2994-00	Four-Channel Capability; expands channel interface capability to four channels; two required for dual processors	6,472	37	188	138
7053-97	First Cache Storage Unit; provides 917,504 words of RAM; requires Segment Descriptor Table to operate in cache/disk mode	72,000	469	2,130	1,600
7053-96	Cache Storage Expansion Unit; 917,504 words or RAM; up to three per 5057 Control	72,000	469	2,130	1,600

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		Purchase Price ($)	Monthly Maint. ($)	Monthly Charges* 1-Year Lease ($)	Monthly Charges* 5-Year Lease ($)
MASS STORAGE (Continued)					
F3117-02	Segment Descriptor Table; 64K words of RAM for cache memory index for 7053	8,200	30	275	250
K3351-00	7053 Memory Expansion; provides additional 917,504 words of RAM	36,000	185	1,065	800
F3118-00	Dual Access for 7053-97	4,416	16	138	123
F3118-01	Dual Access for 7053-96	4,416	16	138	123
5057-87	Semiconductor Auxiliary Storage (SAS); manages up to four 7053 units to be used only in solid-state disk mode	41,715	355	1,239	927
F4025-01	SAS Cache/Disk Upgrade; converts SAS unit to a 5057-95 cache/disk processor	11,245	—	531	397
MAGNETIC TAPE UNITS					
5058-00	Uniservo 22 Subsystem; includes two Uniservo 22 tape drives and control for up to eight Uniservo 22 or Uniservo 24 drives	71,040	411	2,235	1,659
5058-02	Uniservo 22 Magnetic Tape Drives; includes two dual-density PE/NRZI drives; 1600/800 bpi, 9-track, 75 ips	47,040	267	1,386	1,029
5058-06	Uniservo 24 Subsystem; includes two Uniservo 24 tape drives and control for up to eight Uniservo 24 or Uniservo 22 drives	78,720	455	2,466	1,827
5058-08	Uniservo 24 Magnetic Tape Drives; includes two dual-density PE/NRZI drives; 1600/800 bpi, 9-track, 125 ips	54,720	311	1,617	1,197
F0825-00	Dual Channel Feature; provides non-simultaneous operation on two channels of one processor or one channel on each of two processors	4,272	34	110	89
F2627-00	Translation Feature; translation is ASCII/EBCDIC, fieldata/EBCDIC, or fieldata/ASCII	1,728	15	52	36
F2627-01	Second Translation Feature	1,728	15	52	36
F3820-00	Dual Access Feature	2,016	16	56	44
5055-99	Uniservo 26/28 Control; controls up to eight Uniservo 26 and 28 tape units; also controls Uniservo 22 and 24 tape units with F2451-00 installed	22,700	140	635	470
F2451-00	Adds 9-track NRZI to 5055-99	3,170	16	82	63
F3738-00	Dual Channel Feature for the 5055-99; provides non-simultaneous access to the control from two block multiplexer channels	1,000	4	34	25
F3739-00	Translation Feature; ASCII to/from EBCDIC	3,600	18	94	72
0884-00	Uniservo 26 Magnetic Tape Unit; dual-density GCR/PE, 6250/1600 bpi, 9-track, 75 ips	22,000	180	595	440
0884-02	Uniservo 28 Magnetic Tape Unit; dual-density GCR/PE, 6250/1600 bpi, 9-track, 125 ips	24,750	190	675	500
F3737-00	Dual Access Feature	900	5	27	20
5042-00	Uniservo 30 Control for up to eight 9-track, dual density (GCR/PE) Uniservo 30, 32, 34, or 36 drives	36,214	399	1,290	953
F2131-00	Adds 9-track NRZI to 5042-00; prerequisite for Uniservo 30 drives and all 7-track NRZI features	3,171	26	88	66
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	15	49	38
F2585-01	Second 9-track Translator; F2585-00 required	1,785	15	49	38
F2584-99	Adds 7-track NRZI to 5042-00; includes ASCII to BCD translator and data conversion	1,617	13	44	34
F2584-98	Translator is ASCII to fieldata	1,617	13	44	34
F2584-97	Translator is fieldata to BCD	1,617	13	44	34
F2135-00	Dual Channel Feature for the 5042-00; provides non-simultaneous access to the control from two block multiplexer channels; not software supported	4,185	44	138	104
F2137-00	Drive Expansion Feature for the 5042-00; provides for up to 16 Uniservo 30, 32, 34, or 36 drives to be attached to the 5042-00	668	5	23	16
0872-00	Uniservo 30 Magnetic Tape Drives; 9-track, dual density, PE/NRZI, 1600/800 bpi, 200 ips	27,300	251	903	631
0872-02	Uniservo 30 Magnetic Tape Drive; 7-track, NRZI, 800/556/200 bpi, 200 ips	27,300	251	903	631
F2123-00	Conversion Feature; converts 0872-02 to 0872-00	3,287	—	91	68
0873-00	Uniservo 32 Magnetic Tape Drive; 9-track, dual density, GCR/PE, 6250/1600 bpi, 75 ips	24,800	227	839	573
0873-02	Uniservo 34 Magnetic Tape Drive; 9-track, dual density, GCR/PE, 6250/1600 bpi, 125 ips	28,300	261	962	654
F2125-00	Conversion Feature; converts 0873-00 to 0873-02	3,675	34	129	85
0874-00	Uniservo 36 Magnetic Tape Drive; 9-track, dual density, GCR/PE, 6250/1600 bpi, 200 ips	29,500	279	1,031	700
PRINTERS					
0770-00	Line Printer and Control; 800 lpm with 48 character set	56,304	372	1,300	1,041
0770-02	1400 lpm	64,896	487	1,498	1,196
0770-04	2000 lpm	86,686	742	3,187	2,074
F1533-00	160 Print Positions for 0770 Series Printers	4,416	26	102	82
F1534-00	Expanded Character Set Control; required for other than 48-character print cartridges	2,880	5	66	53
F2230-00	Printer Upgrade; 0770-00 to 0770-02	8,592	116	198	155
F2230-01	Printer Upgrade: 0770-00 to 0770-04	30,382	249	1,159	559
F2230-02	Printer Upgrade; 0770-02 to 0770-04	21,790	133	961	404
F2822-00	Dynamic Advance Control; reduces slew rate by 50 percent to optimize stacking of light forms	300	—	8	7

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		Purchase Price ($)	Monthly Maint. ($)	Monthly Charges* 1-Year Lease ($)	Monthly Charges* 5-Year Lease ($)
PRINTERS (Continued)					
	Print Cartridges for 0770 Printers:				
F1536-00	48-character Alphanumeric Business/Commercial	462	—	24	19
F1536-01	48-character Alphanumeric Scientific	462	—	24	19
F1536-03	48-character Alphanumeric for United Kingdom	462	—	24	19
F1536-06	48-character ANSI standard OCR-A	462	—	24	19
F1537-00	94-character ASCII Graphic (ANSI X3.4-1968)	462	—	24	19
F1537-03	68-character ISO Universal OCR-B	462	—	24	19
F1537-04	68-character OCR H-14 Universal	462	—	24	19
F1537-05	58-character Cobol/Fortran/Business	462	—	24	19
F1537-06	177-character International	462	—	24	19
F1537-09	24-character Numeric	462	—	24	19
F1537-11	68-character Universal OCR-A	462	—	24	19
F1537-12	68-character Universal ECMA-11 OCR-B	462	—	24	19
F1537-13	68-character Universal Univac 77L OCR-B	462	—	24	19
F1537-14	63-character Modified Fortran	462	—	24	19
F1537-15	63-character Modified ASCII	462	—	24	19
F1537-19	384-character American Library Association	462	—	24	19
F1537-21	128-character OCR-A	462	—	24	19
F1537-23	94-character Optimized ASCII	462	—	24	19
F1537-24	68-character Optimized IOS Universal OCR-B (Cartridges are also available for languages other than English)	462	—	24	19
0776-00	Line Printer and Control; 760 lpm with 48 character set	36,570	284	1,006	803
0776-02	900 lpm	41,340	340	1,134	907
0776-04	1200 lpm	48,000	388	1,431	1,145
F2217-00	Printer Upgrade; 0776-00 to 0776-02	4,770	56	128	104
F2245-00	Expanded Character Set Control; required for character sets with more than 64 characters	1,910	5	50	40
	Print Cartridges for 0776 Printers:				
F2216-00	48-character Alphanumeric Business/Commercial	1,270	—	34	26
F2216-01	48-character Alphanumeric Scientific	1,270	—	34	26
F2216-07	24-character Numeraic	1,270	—	34	26
F2216-08	63-character Modified Fortran	1,270	—	34	26
F2216-09	63-character Modified ASCII	1,270	—	34	26
F2216-10	48-character OCR-A	1,270	—	34	26
F2215-00	94-character ASCII	1,270	—	34	26
F2215-03	68-character ISO Universal OCR-B	1,270	—	34	26
F2215-04	68-character OCR H-14 Universal	1,270	—	34	26
F2215-05	58-character Cobol/Fortran/Business	1,270	—	34	26
F2215-11	68-character Universal OCR-A	1,270	—	34	26
F2215-12	68-character Universal ECMA-11 OCR-B	1,270	—	34	26
F2215-13	68-character Universal Univac 77L OCR-B	1,270	—	34	26
F2215-20	94-character Optimized ASCII	1,270	—	34	26
F2215-21	68-character Optimized ISO Universal OCR-B	1,270	—	34	26
F2215-23	128-character OCR-A	1,270	—	34	26
0777-97	On-Line Laser Printer, Model I; up to 21,000 lpm; includes controller, disk drive, PE tape drive, CRT console, forms splicing station, and diskette with 15 character sets	270,000	950	—	8,283
0777-87	On-Line Laser Printer, Model II; same as 0777-97 but includes two diskettes with 15 character sets each	284,500	872	8,732	6,615
F3380-00/-01	Additional Character Sets; for 0777-97	30	—	—	—
F2874-00	Character Font Expansion; up to 255 characters; for 0777-97	3,640	17	109	82
F3815-00	Character Font Expansion; up to 255 characters; for 0777-87	3,640	17	109	82
F3816-00	Character Font Expansion; up to 1024 characters; for 0777-87	14,560	78	500	344
F3816-02	Character Font Expansion; up to 3200 characters; for 0777-87	43,680	235	1,500	1,033
F3816-99	Character Font Upgrade; expands an 0777 printer with 1024-character font storage to 3200-character font storage	29,120	157	1,000	689
F3816-98	Character Font Expansion; same as F3816-00, but for field installation only on 0777-97	14,560	78	500	344
F3816-97	Character Font Expansion; same as F3816-02, but for field installation only on 0777-97	43,680	235	1,500	1,033
F3935-XX	Alternate Developer Station; for 0777-97	14,500	24	810	613
F2876-00	Forms Overlay Capability	11,700	34	352	261
F3426-00	Overlay Transparencies	35	—	—	—
1963-00	Burster/Trimmer/Stacker	40,196	181	1,278	900
F3595-00	Forms Counter for 1963-00	1,580	5	40	34
F3598-00	Center Slitter for 1963-00; provides lengthwise separation of forms	900	11	21	18
F3601-00	One-Wide Roll Imprinter; for special printing on forms before bursting; requires 1963-00	1,060	27	25	21
F3601-01	Two-Wide Roll Imprinters; same as F3601-00, but provides two-wide printing	1,520	27	45	38

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PUNCHED CARD EQUIPMENT					
0604-99	Card Punch and Control; 250 cpm	31,968	251	664	536
0716-89	Card Reader and Control; 1000 cpm; comes with code translator; EBCDIC, ASCII, compressed code, or fieldata code	16,545	179	445	322
F1487-00	51-Column Card Read Feature	1,968	17	45	32
F1487-01	66-Column Card Read Feature	1,968	17	45	32
F1488-00	Validity Check	816	—	18	14
F1498-00	Stacker Feature; permits the alternate filling of stackers one and two when in the stop-on-error mode	528	—	12	8
F1486-00	Translate Mode conversion; from EBCDIC to ASCII	105	—	—	—
F1486-01	Compressed Code to ASCII	105	—	—	—
F1486-02	ASCII to EBCDIC	105	—	—	—
F1486-03	Compressed Code to EBCDIC	105	—	—	—
F1486-04	ASCII to Compressed Code	105	—	—	—
F1486-05	EBCDIC to Compressed Code	105	—	—	—
F1486-06	To Fieldata Code	100	—	—	—
F1530-00	Adds a second translator to translate mode under program control	1,104	5	25	18
GENERAL COMMUNICATIONS SUBSYSTEM					
8583-00	General Communications Subsystem (GCS); includes Communications Terminal Controller (CTC); houses maximum of 32 communications terminals with interface or communication terminal dialers	24,000	120	625	500
F1971-00	Expansion Power Supply; required when 24 or more terminals are included in the GCS configuration	1,630	5	57	43
F1972-00	Spare CTC for controlling up to 32 lines in ESI mode on an I/O channel	7,200	48	248	190
F1973-00	Communication Terminal Asynchronous; up to 2400 bps; asynchronous bit serial transmission	1,920	13	50	40
F1973-01	Communication Terminal Asynchronous; same as F1973-00, but with external interrupt capability	2,880	19	101	76
F1973-02	Communication Terminal Asynchronous VII; provides for block parity generation and checking	2,590	19	91	69
F1974-00	Communications Terminal Synchronous—Standard; up to 50,000 bps; synchronous bit serial transmission	2,880	17	75	60
F1974-01	Communications Terminal Synchronous; same as F1974-00, but with external interrupt capability	3,410	24	120	90
F1974-02	Communications Terminal Synchronous VII; provides for block parity and checking	3,070	24	108	81
F1975-00	Communications Terminal Synchronous; up to 56,000 bps, bit serial transmission	2,880	23	114	76
F1976-00	High-Level Communications Terminal; provides capability to handle bit-oriented Data Link Control, up to 56,000 bps	3,600	25	127	95
F1977-99	Communication Terminal Dialer	530	3	18	14
F1978-00	Communication Interface—Telegraph	190	1	6	4
F1979-00	Communication Interface—Modem	480	2	13	10
F1979-01	Identical to CI—Modem (1979-00) except permits use of modem not having a receive clock	530	3	18	14
F1980-00	Communication Interface—High-Speed (allows connection to a CTS-Std. or CTS—VII to the CCITT V.35 interface)	670	4	23	18
F1980-01	Communication Interface (allows connection of a CTS—Std. or CTS—VII to the ATT 303 modem or equivalent)	670	4	23	18
F1983-00	Spare Basic Clock	190	1	6	4
F1984-00	Expansion Clock (provides asynchronous timing rates not included in the basic clock)	190	1	6	4
F2072-00	Communications Interface (allows connection of CTS—Std. or CTS-VII to a MIL 188C synchronous interface)	530	3	18	14
F2074-00	Communications Interface—automatic inbound bit rate detection	1,100	3	38	30
DISTRIBUTED COMMUNICATIONS PROCESSORS					
1986-99	Distributed Communications Processor/10 (DCP/10) Front-End Processor; includes cabinet, processor with 512K bytes of memory, integrated flexible disk subsystem plus 8406 free-standing flexible disk subsystem with two drives, active line indicators, 1100 Series ISI host interface line module, and ports for up to 5 line modules; requires UTS20 console or Uniscope-compatible terminal on a communications line module	27,687	159	814	646
1986-95	DCP/10 Remote Concentrator; includes cabinet, processor with 512K bytes of memory, integrated flexible disk subsystem plus 8406 free-standing flexible disk subsystem, active line indicators, and ports for up to 6 line modules	22,847	131	684	541
1986-91	DCP/10; same as 1986-99 except it includes 4.6MB Model 8409 hard disk instead of free-standing flexible disk	31,577	208	1,028	800
1986-87	DCP/10; same as 1986-95 except it includes 4.6MB hard disk instead of free-standing flexible disk	26,695	180	897	694
1986-83	DCP/10; same as 1986-91 but with 14MB hard disk	32,631	220	1,127	873
1986-79	DCP/10; same as 1986-87 but with 14MB hard disk (DCP/10s are also available without cabinets)	27,791	192	997	768

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		Purchase Price ($)	Monthly Maint. ($)	Monthly Charges* 1-Year Lease ($)	Monthly Charges* 5-Year Lease ($)
DISTRIBUTED COMMUNICATIONS PROCESSORS (Continued)					
F3895-00	Power Supply Expansion; provides additional +5 volt power	882	5	26	21
F3878-00	Byte Interface Line Module; provides 8-bit interface to 8406 free-standing diskette or 8409 disk; one included with DCP/10	1,900	11	56	45
8409-99	Disk Subsystem; includes cabinet, control, and 4.6MB disk drive; may be expanded to 14MB; requires F3878-00	9,650	82	378	280
8409-97	Disk Subsystem; same as 8409-99 but includes 14MB disk drive	10,746	94	478	354
F3900-00	8409 Disk Expansion; provides a second 4.6MB drive	3,777	54	158	117
F3900-01	8409 Disk Expansion; provides a second 14MB drive	4,207	66	188	139
F4085-00	Disk Expansion; expands capacity of 8409-99 from 4.6MB to 14MB	1,096	12	100	74
F3881-00	Dual Disk Control; provides second DCP interface to 8409 disk subsystem	2,000	9	65	50
8597-98	Distributed Communications Processor/20 (DCP/20) Model I; preconfigured system including processor with 384K bytes of memory, integrated flexible disk subsystem, free-standing 8406 flexible disk and F3145 expansion, active line indicator, 1100 Series ISI host interface, and 8-bit parallel interface; accommodates up to 13 line modules; requires UTS 20 or UTS 400 console on a communications line module	46,980	249	1,242	991
8597-90	DCP/20 Model II; includes same components as Model I except has cartridge disk instead of free-standing flexible disk and 16-bit parallel interface; accommodates up to 12 communications line modules; requires UTS 20 or UTS 400 console	66,489	380	1,706	1,323
8597-99	DCP/20; includes processor with 256K bytes of memory, operator panel, and maintenance panel; provides mounting for 16 line modules; 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	145	756	605
8597-01	DCP/20 Free-standing Expansion Cabinet; contains processor capable of performing I/O functions only; provides mounting for 8 line modules; requires F1936-00 in basic cabinet; maximum of two per DCP/20 system	24,000	119	625	500
F3539-00	128K-byte Memory Increment; maximum of two per DCP/20	4,500	24	131	105
F3539-99	256K-byte Memory Increment; maximum of one per DCP/20	8,650	48	225	180
F2894-00	Line Module Expansion; provides for an additional 8 line modules in 8597-01	12,000	60	460	250
F2895-00	Active Line Indicator; provides a visual display of line activity on up to 16 half/full duplex communications lines	890	4	25	20
F1949-00	8-bit Parallel Interface for 8406-04	1,045	4	30	25
8596-95	Distributed Communications Processor/40 (DCP/40) Model I; preconfigured system including processor with 512K bytes of memory, integrated flexible disk subsystem, free-standing cartridge disk and control, 1100 Series interface, 16-bit parallel interface, and active line indicators; accommodates up to 11 communications line modules; requires UTS 20 or UTS 400 console on a communications line module	117,439	664	3,033	2,383
8596-87	DCP/40 Model II; includes same components as Model I except accommodates up to 27 communications line modules; includes second IOP	133,319	749	3,448	2,713
8596-96	DCP/40; includes processor with 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	452	2,195	1,755
K1930-01	512K-byte Memory Increment; three may be added to 8596; additional memory uses 1945-00	15,600	126	410	325
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	146	705	565
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	145	700	560
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	77	365	290
F1933-00	IOP Controller Module; mounts in 1945-00; includes IOP and space for three additional IOPs and storage port expander	14,680	78	380	305
F2941-99	Second IOP Expansion; provides second IOP for 8596 or 1945-00; includes power for two more IOP expansions	14,920	81	390	310
F1932-99	Third IOP; mounts in 1945-00 or 8596; includes storage port expander	14,185	75	370	295
F1932-98	Fourth IOP; mounts in 1945-00 or 8596	10,635	57	280	220
F1928-00	Operator Station; work surface for local console and free-standing flexible disk unit	1,200	—	30	25
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	20
	Features for DCP/10, DCP/20, and DCP/40:				
F1939-00	Integrated Flexible Disk Subsystem for DCP/20 and DCP/40; includes 256K-byte flexible disk and controller; mounts in 8496-96 or 8597-99; one required	1,920	12	50	40
F1936-00	DCP/20-DCP/40 Storage Port Expander, provides a multiplexed interface to a single local storage access port for up to four requestors; required on DCP/20 when using Expansion cabinet	3,550	19	95	75
F1946-02	1100 Series ISI Interface; provides a full-duplex ISI interface to a word channel; maximum of one per DCP/10, two per DCP/20 cabinet or four per DCP/40 cabinet	4,000	23	105	85
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	23	105	85

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		Purchase Price ($)	Monthly Maint. ($)	Monthly Charges* 1-Year Lease ($)	Monthly Charges* 5-Year Lease ($)
DISTRIBUTED COMMUNICATIONS PROCESSORS (Continued)					
F1948-01	16-bit Peripheral Interface; provides interface to a peripheral subsystem; allows operation in 8- or 16-bit mode (for DCP/20 and DCP/40)	3,000	16	80	65
F1941-00	Full-Duplex Interface to Asynchronous Data Sets; conforms to EIS RS-232-C and CCITT V.24 and V.28; data set rates up to 2400 bps	960	3	25	20
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	20
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	8	35	30
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	14	63	50
F3163-04	Full-Duplex Interface to Synchronous Modems; conforms to RS-449; up to 9600 bps	1,920	11	50	40
F3164-00	Full Duplex Interface to Bell 303 Modem; up to 64K bps	7,200	38	188	150
F3164-01	Full-Duplex Interface to Carrier Facilities; conforms to CCITT V.35; operates with UDLC protocol data formats (64K bps), V.35 facilities (48K bps), and Bell DDS and DSDS facilities (56K bps)	3,745	21	100	80
F3165-00	Multi-Line Asynchronous Line Module; provides full-duplex interfaces to up to four data sets; conforms to RS-232-C and CCITT V.24 and V.28; up to 2400 bps	2,880	14	75	60
F3835-00	Remote Partitioning Capability; maximum of one on DCP/20 or four on DCP/40	960	5	25	20
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	20
8590-00	Remote Control Module (RCM); provides the capability to control power on/off and other functions of up to four DCP/10, DCP/20, or DCP/40 processors; requires F1937-00, F3163-00 or F3163-04 and/or one or two F3556-00, and F3557-00	13,526	61	355	280
F1937-00	Remote Control Adapter; provides interface between RCM and DCP/20 or DCP/40	1,824	11	48	38
F3898-00	Remote Control Adapter for DCP/10	1,915	11	50	40
2523-00	Line Switch Module (LSM); provides the capability to switch communication lines and/or peripherals from a local or remote source; requires one switch feature; up to 6 switch features supported	28,750	112	748	597
1962-00	LSM Auxiliary Cabinet; provides mounting for up to 10 switch features (for DCP/20 or DCP/40)	6,872	39	197	143
F3557-00	RCM/LSM Microcode	350	1	9	7
F3556-00	RCM/LSM Local Control Interface; provides one loadable line module for the RCM and LSM and one for the DCP	3,600	16	95	75
F3105-00	Modem Expander; enables a second RCM or LSM to share a single RS-232-C modem	1,440	4	38	30
F3109-00	RS-232-C Switch; provides the capability to switch 8 RS-232-C communications lines from one communications controller to another	4,930	22	132	102
F3110-00	CCITT V.35 Switch; up to 8 lines	9,325	43	245	195
F3112-00	RS-449 Switch; up to 4 lines	6,000	27	156	125
F3113-00	16-bit Parallel Interface Switch; up to 4 interfaces (for DCP/20 and DCP/40)	7,200	33	188	150
F3559-00	Bell 303 Switch; up to 4 lines	16,800	82	440	350
8406-04	Free-Standing Flexible Disk Drive for DCP/10 and DCP/20; requires 8-bit parallel interface	3,600	22	103	79
F3145-00	Diskette Expansion; provides second 8406-04 drive	2,160	11	61	47
8408-02	Cartridge Disk Control for DCP/20 or DCP/40; controls up to two F2380 drives	5,564	32	139	104
F2380-04	Fixed/Removable Cartridge Disk Drive; five megabytes fixed, five megabytes removable	17,750	124	439	314
F2187-00	Second I/O Interface for dual F2380 configuration	1,568	9	39	29
0871-01	Uniservo 10 Magnetic Tape Unit; PE/NRZI, 1600/800 bps, 25 ips (for DCP/20 or DCP/40)	13,962	93	318	239
F2721-00	Uniservo 10 Controller; controls up to two drives	10,320	56	284	215
F2879-00	AC Power Switch; provides remote control of second Uniservo 10	1,200	5	32	25
3560-93	UTS 20 DCP Console; includes 12-inch CRT, keyboard, and communications interface	3,225	33	128	97
0797-99	Printer; 80 cps; connects to DCP/10, DCP/20, or DCP/40	1,500	29	84	63
0798-99	Printer; 200 cps; bidirectional; connects to UTS 20	6,650	70	188	156

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
6618-00	Transaction Performance Auditing System (TPAS)	500

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		Monthly Lease Charge ($)
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
6274-00	On-Line System Activity Monitor (OSAM)	150
Communications Processing		
6169-95	Communications Management System (CMS) 1100 DCP/20	250
6169-97	CMS 1100 DCP/40	500
6169-99	CMS 1100 GCS	550
6169-93	CMS 1100 DCP/GCS	550
6159-00	Processor Common Communications System (PCCS)	126
6136-92	DCP/10 Operating System	150
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-XX	BSC 3270 Terminal Handler	150
Data Base/Transaction Processing		
6292-00	Universal Data System (UDS) 1100 Control	200
6700-00	UDS Data Management System (DMS) 1100	1,050
6296-00	UDS Processor Common Input/Output System (PCIOS)	100
6293-00	UDS Relational Data Management System (RDMS) 1100	750
6299-00	UDS Data Dictionary System	500
6177-00	Define File Processor	63
6175-00	Integrated Recovery Utility (IRU)	383
6175-01	IRU Version II	400
6175-02	IRU Version III	450
6291-00	File Administration System (FAS)	150
6155-00	Data Management System (DMS) 1100	956
6176-00	Data Dictionary	383
6152-00	Processor Common Input/Output System (PCIOS)	63
6244-00	Information Management System (IMS) 1100	195
6237-00	Display Processing System (DPS) 1100	289
End User Products		
6146-00	Mapper 1100	978
F6101-00	Mapper Graphics; requires Mapper 1100	150
6290-00	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
6262-00	Interactive Processing Facility (IPF) Command Language	275
6260-00	IPF Control	100
6263-00	IPF Procedures	350
6245-98	Edit 1100	290
6264-00	User Assistance	75
6261-00	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

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		Monthly Lease Charge ($)
Miscellaneous Products		
F3791-00	Univac Printer Interface Software (UPRINTS); provides interface to 0777 Printer	200
F3793-00	Cache Disk Interface Software (CADIS)	400
Local Support Services		
6173-62	1100/71 Model B1	400
6173-91/90	1100/71 Models C1 and C2	580
6173-68/67	1100/71 Models E1 and E2	800
6173-89/88	1100/71 Models H1 and H2	925
6173-72/71	1100/72 Models E1 and E2	1,155
6173-87/86	1100/72 Models H1 and H2	1,300
—	1100/70 Models E1 and E2	1,000
—	1100/70 Models H1 and H2	1,150 ■

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