Sperry 1100/90

MANAGEMENT SUMMARY

Since its introduction in July 1982, the high end 1100/90 Series has been readied for customer delivery and installation. According to Sperry, approximately 20 systems have been installed between December 1983 and September 1984. A number of advanced architectural, technological, and system extensions are incorporated into the 1100/90. As the most powerful system Sperry has developed, the 1100/90 is targeted at the following market areas: manufacturing, government, airlines, communications, aerospace, petrochemical, and scientific institutions.

The 1100/90 can be configured with up to four central processors in a tightly coupled or loosely coupled arrangement. System components are functionally independent, and each component can have multiple access paths to and from other components. The 1100/90 can handle a number of jobs simultaneously, including jobs that involve a mixture of realtime, interactive, and batch processing. The 1100/90 will also support high speed scientific processors and data base processors.

The basic 1100/91 Processor Complex consists of a central processor with 16K words (64K bytes) of buffer storage, a Main Storage Unit (MSU) with 2 million words (8 million bytes) of main memory, an Input/Output Processor (IOP) with four block multiplexer channels and eight word channels, a System Support Processor (SSP), a master operator console with system panel, and a processor cooling unit. When configured with two, three, or four CPUs, the system becomes an 1100/92, 1100/93, or 1100/94, respectively. The 1100/90 also supports a maximum of four IOPs, four operator consoles, and two SSPs. Optional equipment in- ➢

The most recent addition to the 1100 Series of large-scale sytems is the 1100/90 System. With double the main memory capacity of the 1100/60, 1100/70, and 1100/80, the 1100/90 provides a new virtual machine capability, and features a number of extensions to the 1100 Series architecture.

Sperry Corporation's top of the 1100 Series product line is its 1100/90 family of large scale mainframes. The 1100/90 offers double the main memory capacity of the 1100/70 and 1100/80, provides a virtual machine capability not found on other 1100 Series models, and features a number of extensions to the 1100 Series architecture. Prepared for mass shipments, Sperry has reported that initial system deliveries and installations have begun.

MODELS: 1100/91, 1100/92, 1100/93, and 1100/94.
CONFIGURATION: From 1 to 4 CPUs, 2 to 16 million words of main memory, 1 to 4 I/O processors, and 12 to 176 I/O channels.
COMPETITION: IBM 308X Series, Honeywell DPS 88/82, Amdahl 580 Series, Burroughs B 7900, NAS AS/91X0.
PRICING: A basic system can be purchased for $2,865,660.

CHARACTERISTICS

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

MODELS: 1100/91, 1100/92, 1100/93, and 1100/94.

DATE ANNOUNCED: July 14, 1982.

DATE OF FIRST DELIVERY: December 1983.

DATA FORMATS

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

FIXED-POINT OPERANDS: One 36-bit single precision word. Addition and subtraction can also be performed upon two-word (72-bit) double precision operands and upon 18-bit half-words and 12-bit third-words; the leftmost bit holds the sign in each case. Moreover, partial words of 6, 9, 12, or 18 bits can be transferred into and out of the arithmetic and control registers. The 1100/90 can also 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 ➢

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cludes up to four Subsystem Access Units that control the partitioning of peripheral subsystems and up to four Subsystem Power Controllers that automatically control the power to peripheral controllers connected to the IOPs. All 1100/90 systems can have up to four MSUs, each of which can house up to four million words (16 million bytes) of memory for a total system capacity of 16 million words (64 million bytes).

The 1100/90 processors feature a number of enhancements over the previously introduced 1100/60, 1100/70, and 1100/80 processors. High density packaging and subnanosecond ECL circuits provide greater logic density and higher switching speeds. The package density of the 1100/90 is 10 times greater than that of the 1100/80. The gate switching speed is 0.37 nanosecond per gate.

The 1100/90 processor also features extended addressing, 24-bit indexing, a virtual machine capability not previously offered on 1100 Series processors, an 8K-word instruction buffer and an 8K-word operand buffer, an instruction pipelining feature that allows three instructions to be executed concurrently, and an arithmetic unit divided into a binary arithmetic section, a high speed multiply section, and a decimal arithmetic section. The Extended Instruction Set, introduced as an option on the 1100/60, is a standard feature on the 1100/90.

Input/output operations are off-loaded from the central processor to the independent Input/Output Processor (IOP). The CPU sends a request to the IOP through a new Universal Processor Interface that consists of a send request/acknowledge pair and a receive request/acknowledge pair. The IOP accepts the request, executes the appropriate channel program, handles path selection and error control, and prepares a completion message for CPU notification and handling. Data is transferred from the IOP to main storage via a two-word-wide interface.

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

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

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). It provides a

positive floating-point number. Single precision negative exponents are biased by 128, while double precision negative exponents are biased by 1024.

INSTRUCTIONS: One word, consisting of 6-bit Function Code, 4-bit Partial-Word or Immediate-Operand Designator, 4-bit Control Register Designator, 4-bit Index Register Designator, 1-bit Index Modification Designator, 1-bit Indirect Address Designator, and 16-bit Address Field. In Extended Instruction Set mode, the Address Field is 12 bits long, and a 5-bit Base Register Select Field and an 18-bit Index Register Format Selector Field are also included.

INTERNAL CODE: Sperry communications terminals and other I/O units can employ a 6-bit Fieldata code, EBCDIC, compressed 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 metal oxide semiconductor (MOS) using 64K-bit chips.

CAPACITY: From 2,097,152 words (8 million bytes) to 16,777,216 words (64 million bytes). Memory is divided into four independent 524,288-word or 1,048,596-word banks that can simultaneously service four different requests.

CYCLE TIME: 360-nanosecond double-word read/write cycle, 600-nanosecond partial-word and block (eight-word) read cycle, and 660-nanosecond block write cycle. Memory refresh takes 360 nanoseconds. Two- or four-way interleaving automatically allocates consecutive block addresses to separate storage banks when consecutive eight-word blocks are being moved. A write request queue can stack up to 16 double-word write requests in each central processor.

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. The MSU also detects single-bit address errors and out of bounds addresses.

STORAGE PROTECTION: The virtual address space is about 69 billion words long and is partitioned into variable-length banks that can contain up to 16 million words. Each bank is described by a data structure called a Bank Descriptor that contains the address of the bank in physical main storage and the upper and lower address limits. A Bank Descriptor Index (BDI) is used to locate the bank in which the data is stored. An OFFSET field locates the word being addressed within the bank selected by the BDI. When a virtual address is moved into a Base Register, a check is made to ensure that the entire bank is resident in physical main storage. If it is not, an interrupt is generated. Access control mechanisms are incorporated to ensure that only authorized activities are permitted to access or modify a bank. The access checks are made by comparing an "access key" in the processor with an "access lock" in the Bank Descriptor. In addition, two independent sets of access permissions, general and special, are associated with each virtual storage bank. Each set of permissions consists of enable bits for read, write, and enter accesses. If the bit is set, the access is permitted; if not set, the access is forbidden. The special access permission bits are used when the access key fits the access lock in the Base Register, while the general access permission bits are used if the key does not fit the lock.

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TABLE 1. CHARACTERISTICS OF THE 1100/90 SERIES SYSTEMS

	1100/91	1100/92	1100/93	1100/94
SYSTEM CHARACTERISTICS				
Date of introduction	July 1982	July 1982	July 1982	July 1982
Number of central processors	1	2	3	4
Number of system support processors	1-2	2	2	2
Number of system consoles	1	2	3	4
Upgradable to	1100/92	1100/93	1100/94	
MAIN STORAGE				
Storage type	64K-bit NMOS	64K-bit NMOS	64K-bit NMOS	64K-bit NMOS
Cycle time, nanoseconds	360	360	360	360
Minimum capacity, words	2097K	2097K	2097K	2097K
Maximum capacity, words	16,777K	16,777K	16,777K	16,777K
Increment size, words	1024K	1024K	1024K	1024K
BUFFER STORAGE				
Cycle time, nanoseconds	30	30	30	30
Capacity, words	8K	8K	8K	8K
I/O CHANNELS				
Number of I/O units	1	2	3	4
Number of word channels	0-40	0-80	0-120	0-160
Number of block multiplexer channels	4-24	8-48	12-72	16-96
Aggregate data rates, bytes per second:				
Word channels	144MB	144MB	144MB	144MB
Block multiplexer channels	68.8MB	68.8MB	68.8MB	68.8MB

wide range of operating facilities including 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.

In addition, Sperry places a strong marketing emphasis on data base and data communications software. The Universal Data System (UDS) 1100 is a collection of programs designed to provide a single, unified data management subsystem. Data communications software includes the Communications Management System (CMS) 1100, which provides the communications interface to a DCA-based DCP/Telcon network, and the Processor Common Communication System (PCCS), which enables applications programs to utilize the communications system.

Sperry's consistent concern with data communications is apparent in the strong emphasis across the entire 1100 product line. The DCP/40 Communications Processor can handle from 16 to 156 communications lines and contains from 512K to 2048K bytes of memory. The DCP/40 can be used as a front-end processor, nodal processor, or remote concentrator, and is supported by Telcon software. The DCP/40 will handle data rates of 45 to 1.3 million bps as

BUFFER STORAGE

CAPACITY: 8K words per buffer. Each central processor has two internal buffers: an instruction buffer and an operand buffer. Each buffer is organized into 256 sets, each of which consists of four 8-word blocks. Both buffers can fetch 8-word blocks from main storage across a 72-bit-wide interface.

CYCLE TIME: The instruction buffer reads two instructions in 60 nanoseconds. The operand buffer has a cycle time of 30 nanoseconds.

CENTRAL PROCESSOR

The 1100/90 central processor features high-density packaging and subnanosecond emitter-coupled logic (ECL) circuits with a gate switching speed of 0.37 nanosecond. The packaging technology, which Sperry terms High-Performance Packaging (HPP), provides 10 times the density of the 1100/80 system. The HPP technology uses liquid cooling to maintain a constant conservative temperature. Cold plates placed between the circuit cards conduct the generated heat to a circulating liquid coolant. The coolant flows to an external cooling unit that serves as a heat exchanger between the coolant and the customer-supplied chilled water system. The cooling unit also monitors temperature, pressure, and leak sensors. Each cooling unit can support up to two processors, and dual porting of the processors and cooling units allow complete redundancy.

The central processor arithmetic unit is divided into three sections: a binary arithmetic section, a binary high-speed multiply section, and a decimal arithmetic section. Each section is optimized to reduce execution time for its specific type of calculation. The arithmetic unit performs 36-bit single-length shifting or 72-bit double-length shifting. Addi-

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well as automatic answering and dialing. The DCP/40 supports UDLC, bisync, synchronous and asynchronous transmission.

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

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

COMPETITIVE POSITION

The high-end 1100/90 Series is intended to compete directly with IBM's top of the line 308X Series. IBM's recent revamping of the 308X family, with the addition of six new X model processors which offer performance improvements over the previous models, generates greater competition for Sperry. In terms of price/performance comparisons, the single-processor 1100/91 is targeted at the 3083 Model Group JX, the dual-processor 1100/92 offers performance equal to or better than the 3081 Model Group GX, the three-processor 1100/93 is aimed at the 3081 Model Group KX, and the four-processor 1100/94 competes in the 3084 Model Group QX performance range. Although Sperry matches the number of central processors featured on the 3084, it provides only half the memory capacity.

The two mainframe manufacturers to rival IBM's 128 megabyte memory capacity are Honeywell and Amdahl. The Honeywell DPS 88/82 also offers 128 megabytes of main memory, yet supports only one or two central processors. The Amdahl multiprocessor models 5868 and 5880 both offer 128 megabytes of main memory which further strengthens Amdahl's position in the price/performance race against IBM. Of the remaining mainframe systems, only the Burroughs B 7900 surpasses the 1100/90 on a memory capacity with its main storage capacity of 96 megabytes.

Plug-compatible manufacturer National Advanced Systems also provides a system contender with its top-end AS/90X0 Series. Offering 64 megabytes of main memory and supporting up to two central processors, the AS/90X0 systems are positioned below the 1100/90 Series. However, NAS's recent entrance into the vector processing realm with the introduction of AS/91X0 array processors enables this vendor to retain a highly competitive placement since the 1100/80 is the only member of the 1100 Series to offer the Array Processor Subsystem.

tion and subtraction of fixed-point numbers can be performed on half- or third-words simultaneously. In addition, there are nine special internal registers that define arithmetic operational rules and exceptions.

Other central processor features include an instruction pipelining feature that permits the concurrent execution of three instructions, a wraparound feature that routes intermediate results from one instruction to the appropriate registers when needed by the following instructions, a duplicate index file that accelerates operand and instruction address formation, an address range of 16 million words, 24-bit indexing, and a Universal Processor Interface that provides interprocessor communications.

Each 1100/90 system includes a system clock unit that provides synchronized clock signals for the central processors, I/O Processors, and Main Storage Units. A motor alternator that provides the system with 400-hertz power is required. An optional Performance Monitor is available for analyzing system performance.

The 1100/90 system includes a number of Availability, Reliability, and Maintainability (ARM) features. These include transient-free design, extensive error detection and recovery, error logging and analysis, on-line fault analysis, diagnostic software, and a remote maintenance interface. Failure in the System Support Processor (SSP) will not cause a system failure, and if the system console fails, the SSP can function as a system console.

REGISTERS: The 1100/90 processor contains two sets of program-addressable registers: the General Register Set (GRS) and the Base Register Set. The GRS includes 128 control registers. User programs can make use of a Non-Indexing Register, 11 Index Registers, 4 Overlapped Registers that can be used as either Index Registers or Accumulators, 12 Accumulators, 4 Unassigned Registers that are available as temporary storage locations, and 32 Jump History Registers. Also available are 16 Special Registers, including a Latent Parameter Register, a Repeat Count Register, a Mask Register, and User Registers that can be used as loop counters, transient registers, or storage for intermediate values or constants. A duplicate set of Executive control registers is accessible only by the operating system.

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 and test operations. The Jump History Register holds the recent 24-bit absolute addresses of jump instructions.

The Base Register Set consists of 32 registers, each containing a virtual address. In basic instruction mode, only base registers B12 to B15 are available. In extended instruction mode, either the first 16 base registers or all 32 base registers are available, depending on the current processor privilege level. User programs can address base registers B0 to B15 only. Base registers B16 to B31 are executive base registers accessible only to the operating system. The B0 register points to the current instruction stream when in extended mode, and the B1 register points to the programming language "automatic" stack and can only be modified by very privileged executive routines. The B2 to B11 registers are available for program data, while the B12 to B15 registers point at either code or data in basic mode or at data in extended mode. The B16 register points to the interrupt vector and the bank descriptor table for Level 0 virtual addresses, and the B17 to B19 registers point to the bank descriptor tables for Levels 1 to 3 virtual addresses. The B20 register points to the table containing a copy of the virtual addresses loaded into B1 to B15, the B21 register

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ADVANTAGES AND RESTRICTIONS

The architectural enhancements implemented in the 1100/90 are the most extensive in the 1100 Series product line. Intended to provide a growth path for current 1100 Series users, the 1100/90 offers upward mobility and increased functionality. Within the 1100/90 product line, growth is accomplished by simply adding components in the areas required, whether it's memory, peripherals, or communications.

The design of this system offers increased performance over earlier systems. According to Sperry, performance is increased three to four times for an 1100/91 versus 1100/81 or 1100/94 versus 1100/84. To lessen overhead on the central processor unit, all input/output functions are entirely removed, self-standing with their own logic. The 1100/90 is modularly designed and therefore can be easily partitioned into smaller systems for maintenance without disrupting the entire system. Remote maintenance using the System Support Processor communicating with Sperry's TRACE (Total Remote Assistance Center) adds to system maintainability.

The 1100 Operating System is compatible throughout the entire 1100 Series thus providing either upward or downward compatibility. Within the 1100 Series, Sperry has maintained a high degree of program and data compatibility. This has been continued with the 1100/90, 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. The 1100 Series implementations of the Cobol, Fortran, Algol, Basic, PL/1, and Pascal languages, however, are generally in accordance with the accepted standards for these languages. The 1100 Series systems originally used the 6-bit Fieldata code, but in an effort to resolve the resulting compatibility problems, Sperry has gradually revised most of the hardware and software to make use of ASCII. Thus, for most practical purposes, an 1100 Series computer can now be considered a byte-oriented ASCII machine.

One restriction exists for users of some of the earlier peripherals. The following peripherals are not supported on the 1100/90: 8414, 8424/25, 8440, and 8460 disks; 5039, 5033, and 5024 disk control units; Fastrand drums, also Uniservo 12 and 14 tape drives; 5017 and 5045 tape control units; and Communications/Symbiont Processor (C/SP).

USER REACTION

Datapro's 1984 survey of general-purpose computer users yielded no responses from 1100/90 users because initial deliveries have just begun. Prospective buyers may wish to consult Report 70C-010-50, "User Ratings of Mainframes," for user experiences with other members of the 1100 Series. □

points to the current return control stack, the B22 register points to the interrupt control stack, and the B23 to B31 registers are available to executive code. Levels 0 to 3 are assigned to the program banks to indicate the degree to which the banks are to be shared.

A processor state or condition is maintained for each program activity. The processor state consists of the internal registers of the central processor that are required for system operation, including the addressing state, the register state, the activity state, and the instrumentation state. The addressing state consists of the Base Register Set, while the register state consists of the GRS.

The activity state includes the registers required for operational control of an activity. The activity state consists of the following: the Program Address Register, which contains the virtual address of the current instruction; the Designator Register, which controls the basic operational modes and conditions of the processor; the Indicator/Key Register, which contains mid-execution control indicators, the current access key value, and pending interrupt indicators; two Quantum Timers, one of which counts both real and virtual processing and one of which counts only virtual processing; and four Interrupt Status words.

The instrumentation state includes the Breakpoint Register, the Jump History Register, and software monitoring controls.

INSTRUCTION REPERTOIRE: To a great extent, the 1100/90 instruction set is identical with that of other 1100 Series systems in order to maintain compatibility. To utilize the full capabilities of the 1100/90, additional privileged instructions and an extended mode of operation with several new instructions have been included.

The 1100/90 has 271 instructions. Of these, 26 are available in basic mode only and 30 are available in extended mode only. The instruction set includes: 16 load instructions, 20 store instructions, 30 fixed-point arithmetic instructions, 15 floating-point instructions, 16 search and masked search instructions, 7 data type conversion instructions, 37 test instructions, 12 shift instructions, 28 conditional and unconditional jump instructions, 6 interbank jump instructions, 4 logical instructions, 24 miscellaneous instructions, 11 character manipulation instructions, 2 stack instructions, 12 address space management instructions, 12 activity control instructions, 8 dayclock instructions, 4 universal processor interface instructions, 5 recovery and partitioning control instructions, and 2 virtual machine instructions.

INTERRUPTS: An interrupt suspends the current instruction sequence and initiates an instruction sequence starting at an address found at a fixed location relative to the B16 base register. The address of this location replaces the value in the Program Address Register. Except for instructions that are explicitly named as interruptible, the central processor honors an interrupt only after the current instruction is completed and only if the interrupt is allowed.

All external interrupt requests, such as those generated by an I/O processor, are presented to each central processor in the system. Therefore, an interlocked synchronization mechanism is provided to ensure that only one CPU actually accepts the request. There are 64 interrupt priority levels.

VIRTUAL MACHINE FACILITY: The Enter Virtual Machine (EVM) instruction activates the virtual machine facility. The operand of this instruction is a control structure known as a virtual processor control block, which contains a pointer to a set of tables used to translate addresses generated while the virtual machine is active into relative addresses within the space of the program that executed the EVM instruction. This translation is performed through the use of a set-associative look-up paging mechanism. A history of translated addresses is maintained.

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When the EVM activates the virtual machine, the current state of the central processor, such as register contents or designator registers, is saved in the central processor. The contents of the virtual processor control block are transferred into the central processor, overlaying the previous processor state, and the processor is then switched from real mode to virtual mode. The Designator Register is duplicated so that the central processor can respond to interrupt conditions.

The virtual machine facility operates in either program mode or system mode. Program mode provides performance assists for software debugging. This is especially useful when a debugging operation requires actual execution of the object program instructions. Supporting software can control the length of time the virtual machine is active, either by specifying a fixed number of instructions to be executed or by specifying one or more addresses that cause a virtual machine exit when referenced. System mode provides for the controlled testing of operating systems. In system mode, interrupt conditions are processed inside the active virtual machine, while in program mode interrupt conditions are reported to the supporting software.

SYSTEM SUPPORT PROCESSOR (SSP): The 1100/90 SSP is a free-standing system that includes 256K bytes of memory, fixed-disk storage, a magnetic tape unit, and a CRT workstation with printer. The SSP interfaces to the CPU, IOP, and MSU. It performs power control, unit initialization, system partitioning, initial program load, and system maintenance. The SSP monitors each central complex unit, taking recovery and isolation action when errors are discovered. Errors are logged for later analysis. For maintenance, the SSP performs on-line diagnostic testing, full prognosis, and off-line analysis for pinpointing faults.

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.

CONSOLE: The 1100/90 master operator console is a UTS 20 terminal equipped with a clock calendar and a system panel used to control initial program load, assign SSPs to application partitions, and sound a system alarm. The master console also includes a printer. A second display unit and up to six auxiliary consoles can be added. The UTS 20 has a 12-inch screen and a typewriter-style keyboard with function keys and numeric keypad.

SUBSYSTEM ACCESS UNIT (SAU): The SAU is an optional unit that controls the partitioning of peripheral subsystems via commands from the SSP. The SAU allows a peripheral subsystem to be accessible or inaccessible to any application. Peripheral subsystems can be dedicated to a particular application or shared among applications.

SUBSYSTEM POWER CONTROLLER (SPC): The SPC is an optional unit that automatically controls dc power to the peripheral subsystems connected to an I/O processor. The SPC can control up to 64 peripheral control units. It can be operated manually, but usually operates under the control of the SSP.

INPUT/OUTPUT CONTROL

I/O CHANNELS: The 1100/90 Processor Complex contains one Input/Output Processor (IOP). The IOP consists of a central control module (CCM) and up to six channel modules. The CCM provides independent control paths to up to four CPUs and up to two SSPs and data paths to/from up to four 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 four block multiplexer channels or eight word channels. Channels can be intermixed in the IOP, but the first channel module must be a block multiplexer channel module. The basic IOP includes a CCM with one block multiplexer channel module and one word channel module. The IOP can be expanded by adding two additional channel modules of either type to the basic cabinet. An IOP expansion cabinet is available to provide space for two more channel modules. Thus, each IOP can include a maximum of 24 block multiplexer channels or 40 word channels in two cabinets. A fully configured 1100/90 system with four IOPs can have up to 96 block multiplexer channels or 160 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 256 subchannels for concurrent operation. Each IOP can support up to 4096 subchannels.

The maximum block multiplexer channel data rate is 4.3 million bytes per second on input and 3.7 million bytes per second on output. The maximum word channel data rate is 3.7 million bytes per second in ISI mode. Maximum aggregate transfer rates are 17.2 million bytes per second per block multiplexer channel module and 18 million bytes per second per word channel module.

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

CONFIGURATION RULES

The basic 1100/91 Processor Complex consists of a central processor with 16K words (64K bytes) of buffer storage, a Main Storage Unit (MSU) with 2 million words (8 million bytes) of main memory, an Input/Output Processor (IOP) with four block multiplexer channels and eight word channels, a System Support Processor (SSP), a master operator console with system panel, and a processor cooling unit. The system can be expanded to include a second SSP, three additional operator consoles, and six auxiliary consoles per operator console. The 1100/91 also supports one Subsystem Power Controller (SPC) and up to four Subsystem Access Units (SAUs).

The 1100/92 includes the basic Processor Complex plus an additional CPU and cooling unit, an additional IOP, and an additional SSP. The 1100/92 supports up to four operator consoles and up to six auxiliary consoles per operator console, two SPCs, and up to four SAUs.

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TABLE 2. MASS STORAGE

Subsystems	8407 Diskette	8430/8433 Disks	8434 Disk	8450 Disk	8470/8480 Disks
Cabinets per subsystem	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*	Up to 1.0M	77M/154M	243.8M	243.3M	403M/1612M
Words*	—	17M/34M	54M	54M	89.6M/384.4M
Tracks/segments per drive unit	77 to 154 per diskette	7,809/15,485	16,682	16,800	20,160/80,000
Average access time, milliseconds	175	27/30	30	23	23
Average rotational delay	83	8.3	8.3	8.3	8.3
Data transfer rate:					
Bytes/second	62,500 max.	806,000	1,257,000	1,260,000	2,097,000
Words/second	—	179,111	279,333	280,000	466,000
Controller model	Integrated	5039	5046	5046	5056
Comments	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.

The 1100/93 includes the basic Processor Complex plus two additional CPUs and cooling units, two additional IOPs, and one additional SSP. The 1100/93 supports up to four operator consoles and 16 auxiliary consoles, up to three SPCs, and up to four SAUs.

The 1100/94 consists of the basic Processor Complex plus three additional CPUs and cooling units, three additional IOPs and one additional SSP. The 1100/94 supports up to four operator consoles and 16 auxiliary consoles, up to four SPCs, and up to four SAUs.

All 1100/90 systems can have up to four MSUs, each of which can house up to four million words (16 million bytes) of memory for a total system capacity of 16 million words (64 million bytes). All 1100/90 systems can have up to four IOPs. The processor cooling units can be expanded to one per processor or restricted to one for each two processors.

Minimum peripheral equipment to complete an 1100/90 system includes an 0776 printer subsystem, a disk subsystem with one control unit and one 8470 disk unit, and a magnetic tape subsystem with one control unit and two Uniservo 22 or 24 magnetic tape units.

As an alternative, a minimum peripheral system would include one 0770 printer subsystem, a disk subsystem with one control unit and one 8480, 8450, 8434, 8433, or 8430 disk unit, and a magnetic tape subsystem with one control unit and two Uniservo 30, 32, 34, or 36 magnetic tape units.

MASS STORAGE

See Table 2.

CACHE/DISK SYSTEM: A hierarchical mass storage system that provides a level of memory between the 1100/90 processor and 8450, 8470, or 8480 disk drives. The Cache/Disk System consists of one or two 5057 Cache/Disk Processors, up to four 7053 Storage Units, and up to 16 8450, 8470, or 8480 disk drives.

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

The 5057 Semiconductor Auxiliary Storage Processor (SAS) manages storage consisting of up to four 7053 cache storage units to be used exclusively in the solidstate disk mode. No caching or disk attachment provided.

In solidstate disk mode of the 5057 Cache/Disk Processor, or in the 5057 SAS Processor, 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. 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).

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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	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	800 lpm	132	10	6 or 8	3.5 to 22 in. wide, 24 in. long
0770-02 0770-04	1400 lpm 2000 lpm	132 132	10 10	6 or 8 6 or 8	
0776-00	760 lpm	136	10	6 or 8	4.0 to 18.75 in. wide, 24 in. long
0776-02 0776-04	900 lpm 1200 lpm	 136	136 10	10 6 or 8	6 or 8
*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	2 2000-card stackers	51- or 66-col. cards, validity checks, alternate stacker filling, dual translate
0604 Card Punch	80	250	1000	2 1000-card stackers	—

INPUT/OUTOUT UNITS

MAGNETIC TAPE UNITS: See Table 3.

PRINTERS: See Table 3.

CARD EQUIPMENT: See Table 3.

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 1100/90 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.

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

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

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

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

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

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

For user migration, there are several different microprogrammed packages available to run on the DCP/40. One is designed for the user of a Series 90 CPU, and permits the DCP/40 to emulate an MCC to the host. Another package offers the DCP/40 emulation of an original DCP; the last drives the DCP/40 in its own "native mode." The major advantage of the emulation packages is that the user need not change his existing communications software, which may be resident in either his host or in an original DCP. Programs and user code running an original DCP cannot be run on a DCP/40 operating in "native mode"; new user code and operating software needs to be assembled and generated.

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

The Telcon-controlled system performs all message control operations. As users access the system (network), predetermined routing paths are followed, or alternate routes are selected using predefined table search routines should established paths become unavailable. Specialized I/O controllers (frequently microcoded modules) handle specific functions including terminal interfaces, line, trunk, or channel control.

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.25 packet switching services.

DCP message switching can be achieved through user-coded applications which use the message routing facilities inherent in the Telcon software. Message routing between terminals, host systems, and network-resident applications is achieved either through user definition in the network generation process, or by a dynamic selection through network management services.

If multiple DCPs are configured in the network, each is assigned both specific and network-common responsibilities. For example, all messages remain the responsibility of the originating DCP until accepted by another DCP or end user. Under normal conditions, main memory is used to maintain message queues and buffers, with disk storage used for overflow. Terminal and line handlers are placed as close to the terminals or gateway links as possible, usually in the nearest DCP. This philosophy permits as much of the network as possible to consist of high-speed trunk lines, and the low-speed lines running a variety of different terminal protocols, character codes, transmission speeds and modes, to be minimized.

In addition to off-loading the host, the DCP lends a degree of network reliability and resiliency to the user. The standalone capability of a single network DCP may permit continued message acceptance and storage of data during periods of temporary inaccessibility to a given host or terminal. Similarly, multiple DCPs may be redundantly configured to maximize network uptime or increase network throughput. The user is free to mix and match all of the communications processors and subsystems thus far discussed into an efficient communications network. Cost may be a limiting factor in providing increased sophistication.

The Telcon operating system supports local disk and magnetic tape storage for their respective DCPs. This support permits functions including store and forward message switching, logging, journalization, file management, and monitoring.

The Uniservo 10 Magnetic Tape Subsystem provides magnetic tape I/O for the DCP. The subsystem configuration consists of two tape drives housed in a single cabinet, along with the basic control logic. Data is recorded in the 9-track mode at 1600 bpi PE or 800 bpi NRZI. Tape speed is 25 ips, forward or backward, yielding a data transfer rate of 40,000 bytes per second PE and 20,000 bytes per second NRZI.

A Sperry cartridge disk subsystem provides mass storage on the DCP for network data base storage and other storage associated with distributed communications and distributed processing applications. The subsystem has a 10-million-byte capacity, 5 million bytes on a fixed disk and 5 million bytes on a removable disk. Recording is on four surfaces in each unit, two on each disk. The disk rotates at 2400 rpm and has an average rotational delay time of 12.5 milliseconds. The average head movement time is 50 milliseconds and the data transfer rate is 312,000 bytes per second.

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A Sperry diskette subsystem is provided on the DCP for loading the operating system and diagnostic programs, for statistics logging of network operations, for error logging, and as a recording medium for receiving various down-line load functions. In cases where a cartridge disk is not available on the DCP, the diskette will retain various network control tables. The basic diskette subsystem contains one diskette drive, expandable to two drives in the same housing. Each disk can store up to 256,000 bytes of data. The disk rotates at 360 rpm and has an average rotational delay time of 83 milliseconds. Head load and seek time can overlap. Track-to-track seek time is 10 milliseconds and head load time is 50 milliseconds. Data transfer rate is 31,250 bytes per second.

The DCPs require an operator console, which can be either a UTS 20 terminal or a UTS 400 terminal attached to a communications line.

TERMINALS: Sperry offers a wide variety of terminal equipment for use with the 1100/90, including the UTS 4000 Series (see Report 70D1-877-02), the UTS 400 Display Terminal, the Uniscope 200 Display Terminal, and the DCT 500 Series. The Univac BC/7, V77, 90/30, and System 80 computers can also serve as remote communications 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.

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 and/or batch jobs at specified times.

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

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

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

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

Sentry is a security control processor that is used to create and maintain a user security profile 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.

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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 1100/90 system to a DCA-based DCP/Telcon network. 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 queueing, and other message control procedures. The message queue can be maintained in main and/or auxiliary storage; this common data pool is then accessed by the Transaction 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. Typical main storage residence requirements for CMS are 10K to 12K words.

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

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

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

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

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

It is noteworthy that Sperry 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 nonterminals, 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.

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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 Transformation 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 database 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), Information Management System (IMS 1100), and Display Processing System (DPS 1100).

TIP serves as the "middleman" between the 1100 Operating System and the user's application programs in a transaction-oriented on-line data processing system. TIP's functions are stimulated by the incoming transaction messages stored in the common data pool maintained by CMS. The TIP transaction scanner, TRANSCAN, analyzes each message, determines which application program is required to process it, and arranges for the Executive to load and execute that program. One application program can also call another application program via TIP, through program action based on data parameters. The application programs can be written in Cobol, Fortran, Assembly Language, or PL/1 and can be 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 prioritizing messages and other special message manipulation.

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

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

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

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request printing of reports in user-specified formats. RPS 1100 provides tutorial assistance to end users by displaying a choice of functions for user selection and utilizing "fill in the blanks" techniques to permit users to enter commands.

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

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

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

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

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 2,000 active terminals concurrently. Each terminal can be active in one of six modes: APL, Basic, and Fortran language modes; a data mode; master mode; and monitor mode. A quota set regulates each terminal user, restricting use by time of day, maximum CPU usage, maximum program size, maximum data size, maximum program execution time, and language mode selection.

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

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

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

The *ASCII Cobol* compiler implements the modules of the 1974 American National Standard Cobol. Numerous extensions are also included. The ASCII Cobol compiler is 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 nonnumeric 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 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

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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).

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 on-line, 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)

OPTIMA 1100 (Project Management System)

SUFICS 1100 (Sperry Univac Financial Integrated Control System)

UNIDAS 1100 (Information Storage and Retrieval)

UNIFACS 1100 (Univac Financial Systems)

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

PRICING

The 1100/90 is available for purchase or a one-year or five-year lease. All software except the operating system is unbundled. On-site service for operating system support can be obtained for a flat monthly fee. Support for unbundled software is separately priced. 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.

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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	$174	$198
Each addl. hour	87	99

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 1100/90 system customers via a dedicated WATS number 24 hours per day and seven days per week. Via TRACE, a user's system may be monitored and controlled using on-site and remote library testing programs. TRACE 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 operate properly, and can be utilized for comparison purposes during diagnostic testing.

EQUIPMENT: The following systems illustrate two 1100/90 configurations. All necessary control units and features are included in the indicated prices, but software is not included. Quoted lease prices do not include maintenance charges.

1100/91 SYSTEM: Includes Processor Complex (CPU, cooling unit, MSU with 2 million words of main memory, IOP with 4 block multiplexer channels and 8 word channels, SSP, motor alternator, and master operator console), plus one 8470 Disk Subsystem with controller and 4 disk drives (1.6 gigabytes), a Uniservo 24 Magnetic Tape Subsystem with a controller and 6 tape units (1600/800 bpi), and one 1200-lpm 0776 Line Printer and control. Purchase price is $3,266,440 and the monthly charge on a five-year lease is $95,989.

1100/94 MULTIPROCESSOR SYSTEM: Includes Processor Complex (as above) plus 3 additional CPUs, 3 additional MSUs, and 8 one-megaword memory increments for a total of 16 million words, 3 additional IOPs, 7 additional block multiplexer channel modules, 4 additional word channel modules, one additional SSP, 3 operator consoles, an 8480 Disk Subsystem with 2 controllers and 4 disk drive units (6.4 gigabytes), a Uniservo 36 Magnetic Tape Subsystem with controller and 16 tape units (6250/1600 bpi), and two 2000-lpm 0770 Line Printers and controls. Purchase price is $12,916,147 and the monthly charge on a five-year lease is $313,094.

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EQUIPMENT PRICES

		Purchase ($)	Monthly Maint. ($)	Monthly Charges* 1-Year Lease ($)	Monthly Charges* 5-Year Lease ($)
PROCESSOR COMPLEX					
3054-99	1100/91 Processor Complex; includes Instruction Processor (CPU) with cooling unit and power system, Main Storage Unit (MSU) with two million words of memory, I/O Processor with one 4-channel block multiplexer channel module and one 8-channel word channel module, a System Support Processor (SSP), a motor alternator, and a master operator console with CRT display, printer, system clock, and system panel	2,865,660	5,551	115,625	86,740
3054-87	Instruction Processor Expansion; maximum of three per 1100/90 system; 3rd IP in system requires addition of a motor alternator and an IPCU	1,829,293	3,168	44,611	33,467
F3378-00	Instruction Processor Performance Monitor; if used, one is required for each CPU in the system	5,000	11	202	151
3067-00	I/O Processor; provides cabinet, channel controller, and interfaces to main storage; includes one block MUX channel module and space for three additional block MUX or word channel modules in any combination; maximum of three per system	228,000	486	9,199	6,901
1954-01	Instruction Processor Cooling Unit; provides cooling for up to two IPs; required when three or more IPs are included in the configuration	68,000	145	2,744	2,058
K3675-00	Word Channel Module; eight word channels	60,000	128	2,421	1,816
K3676-00	Block Multiplexer Channel; four channels	60,000	128	2,421	1,816
0986-00	Inter-Processor Channel Coupler; interconnects an 1100 series system and a VS/9 system via block multiplexer or selector channels	20,000	55	440	375
F3953-00	FIPS I/O Compatibility; provides one block multiplexer channel with compliance to Federal Information Processing standard 60-1 for each channel for which compliance is necessary	3,000	6	121	91
1964-00	IOP/Expansion Cabinet; provides housing for two block multiplexers or word channel modules in any combination; one channel must be ordered	30,000	64	1,210	908
F3938-00	IOP Performance Monitor; if used one is required for each IOP in the system	5,000	11	202	151
7052-99	Main Storage Unit; provides cabinet interfaces, and 2M words of main storage in four banks; expands to 4M words by the addition of two F3125-00 storage expansions; maximum 16M words per system	270,000	575	10,894	8,173
K3125-00	MSU Storage Expansion; 1M words; maximum of two per MSU	80,000	170	3,228	2,422
4019-99	Operator Console; includes CRT display, keyboard, clock calendar, and printer; provides 37-inch high cabinets with work surface and storage; may be expanded by the addition of a console CRT expansion and up to four auxiliary consoles	75,000	160	3,026	2,270
3660-99	Console CRT Expansion; adds secondary display to operator console or 4019-96	2,500	5	101	76
3660-97	Auxiliary Console; attaches to operator console; maximum of three	6,500	14	262	197
0798-65	Auxiliary Console Printer; 200 cps	8,000	17	323	242
F3697-00	Transition/Storage Cabinet; 28 inches high; attaches to master console, or 4019-97/96, or F3699-01	—	—	—	—
F3697-01	Transition/Storage Cabinet; 37 inches high; attaches to master console, 4019-99/98, or F3699-03 and/or printer	2,556	—	103	77
F3699-00	Work Surface; 28-inch table, 36 inches wide	1,218	—	49	37
F3699-01	Work Surface; 28-inch table, 60 inches wide; attaches to console and/or F3697–00	1,518	—	61	46
F3699-02	Work Surface; 37-inch table, 36 inches wide	1,218	—	49	37
F3699-03	Work Surface; 37-inch table, 60 inches wide	1,518	—	61	46
1980-99	Remote Power Control; includes one subsystem power control (SPC), two IOP interfaces and an SSP interface	26,457	56	1,068	801
K3728-00	SPC Expansion; provides four control unit interfaces; may be expanded to 64 interfaces via F3729-00	16,000	34	646	484
K3729-00	SPC Interface Expansion; expands the number of control unit interfaces by 6; requires 1980-99 or K3728-00; maximum of 10 per SCP	1,600	3	64	48
K3947-00	SPC, SSP Interface; maximum of one F3947-00 per SPC	900	2	36	27
0985-00	Subsystem Access Unit (SAU); provides capability to control subsystem partitioning via commands from one or two SSPs	80,000	170	3,228	2,422
F3832-00	Subsystem Access Unit SPI Interface; provides an additional 32 SPI interface; maximum of three F3832-00 per SAU	11,850	25	478	359
F3833-00	SAU Byte Channel Transfer Switch Interfaces; provides interfaces to two BCTS units; maximum of two per SAU	10,000	21	403	303
F3834-00	SAU/SSP Interface; provides two additional interfaces to SSPs; maximum of one per SAU	10,000	21	403	303
8513-00	Motor Alternator; provides power to central complex; one required for configuration with three or more IPs; may also be used to provide redundant power	58,000	124	2,340	1,756
3058-92	System Support Processor; for multiprocessor application to provide for system partitioning and redundancy	90,000	192	3,631	2,724
MASS STORAGE					
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

*Lease charges do not include maintenance.

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		Purchase ($)	Monthly Maint. ($)	1-Year Lease ($)	5-Year Lease ($)
		Monthly Charges*			
MASS STORAGE (Continued)					
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
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 nonremovable pack; 54.18M words per drive	66,600	314	2,439	1,583
F2561-00	32-Device Capability; allows up to 32 8430, 8433, or 8434 disk drives to be intermixed on one 5046-99 control; two required for 5046-97 dual control	7,680	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	7,680	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; 90M 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 four spindles with a total capacity of 360M; includes dual access feature	83,700	497	2,113	1,761
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 16 8450 drives on cache/disk control; precludes 8470 drives	9,345	55	290	215
F3568-00	8470/8480 Capability Expansion; permits 16 8470 drives or four 8480 drives on cache/disk control; precludes 8450 drives; two required for dual processors	9,345	55	290	215

*Lease charges do not include maintenance.

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		Purchase ($)	Monthly Maint. ($)	1-Year Lease ($)	5-Year Lease ($)
		Monthly Charges*			
MASS STORAGE (Continued)					
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
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	15	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	353	1,239	927
F4025-01	SAS Cache/Disk Upgrade; converts SAS unit to a 5057-95 cache/disk processor	11,245	—	531	397
F2837-00	Power Control Expansion; required when total number of disk drives exceeds 16; two required for 5046-93 dual control	6575	56	222	144
5040-91	8430/8433/8450 FIPS Control; connects via 1100 FIPS block multiplexer channel; controls up to 16 8450 disk drives with F2719-02 installed; eight 8450 and eight 8430/8433 drives with F2719-03 installed, or 16 8430/8433 drives with F2836-02 installed	76,500	555	2,700	1,800
5040-89	Dual Disk Control; same as 5040-91, but with two controls	132,336	969	5,015	3,260
F2719-02	8450 Capability/Conversion; provides 5040-91 or -89 with capability to control 16 8450 drives	132,336	969	5,015	3,260
F2719-03	8430/8433/8450 Capability/Conversion; provides 5040-91 or -89 with the capability to control up to eight 8430/8433 drives and eight 8450 drives	0	0	0	0
F2836-02	8430/8433 Capability/Conversion; provides 5040-91 or -89 with the capability to control up to 16 8430/8433 drives	0	0	0	0
8450-95	8450 Disk Storage; includes two drive units, each with 54M words of storage; conforms to FIPS 63, Class B	49,950	346	2,439	1,583
8450-93	8450 Disk Storage; same as 8450-95 but also includes 194K words of fixed-head storage	63,550	382	2,521	1,677
F2717-98	Fixed-Head Conversion; converts 8450-95 to 8450-93	13,600	34	264	211
F2717-03	8470 Conversion Package; converts 8470-99 to 8470-97	6,800	24	150	111
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 nonsimultaneous 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 nonsimultaneous 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

*Lease charges do not include maintenance.

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		Monthly Charges*			
		Purchase ($)	Monthly Maint. ($)	1-Year Lease ($)	5-Year Lease ($)
MAGNETIC TAPE UNITS (Continued)					
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 nonsimultaneous 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
Print Cartridges for 0770 Series 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 Series 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 Numeric	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

*Lease charges do not include maintenance.

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		Purchase ($)	Monthly Maint. ($)	Monthly Charges* 1-Year Lease ($)	Monthly Charges* 5-Year Lease ($)
PRINTERS (Continued)					
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	270	45	38
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	15,545	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
DISTRIBUTED COMMUNICATIONS PROCESSORS					
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
8597-99	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 eight 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 eight 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

*Lease charges do not include maintenance.

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		Monthly Charges*			
		Purchase ($)	Monthly Maint. ($)	1-Year Lease ($)	5-Year Lease ($)
DISTRIBUTED COMMUNICATIONS PROCESSORS (Continued)					
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 8596-96; 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 the 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 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
F1948-01	16-bit Peripheral Interface; provides interface to a peripheral subsystem; allows operation in 8- or 16-bit mode	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
		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/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
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 six switch features supported	28,750	112	748	597
1962-00	LSM Auxiliary Cabinet; provides mounting for up to 10 switch features	6,872	39	197	143
F3557-00	RCM/LSM Microcode	350	1	9	7

*Lease charges do not include maintenance.

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		Purchase ($)	Monthly Maint. ($)	Monthly Charges* 1-Year Lease ($)	Monthly Charges* 5-Year Lease ($)
DISTRIBUTED COMMUNICATIONS PROCESSORS (Continued)					
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 eight RS-232-C communications lines from one communications controller to another	4,930	22	132	102
F3110-00	CCITT V.35 Switch; up to eight lines	9,325	43	245	195
F3112-00	RS-449 Switch; up to four lines	6,000	27	156	125
F3113-00	16-bit Parallel Interface Switch; up to four interfaces (for DCP/20 and DCP/40)	7,200	33	188	150
F3559-00	Bell 303 Switch; up to four lines	16,800	82	440	350
8406-04	Free-Standing Flexible Disk Drive for 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; 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	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/20 or DCP/40	1,500	29	84	63
0798-99	Printer; 200 cps; bidirectional; connects to UTS 20	6,650	70	188	156

*Lease charges do not include maintenance.

SOFTWARE PRICES

		Monthly Lease Charge ($)
System Processors		
6163-98	Terminal Security System	189
6167-98	Sentry Security Control Processor	635
6158-98	Quota Input Processor (QUIP)	189
6162-98	Checkpoint/Restart	126
6133-98	Data Processor	63
Utility Processors		
6271-98	CULL Processor	25
F3859-98	Interactive CULL (IACULL)	25
6203-98	Fault Location of Interpretive Testing (FLIT)	116
6135-98	Sort/Merge	126
6246-98	Log Analyzer	120
6161-98	Performance Analysis Routines	252
6274-98	On-line System Activity Monitor (OSAM)	250
Communications Processing		
6169-89	Communications Management System (CMS) 1100 DCP/20	500
6169-90	CMS 1100 DCP/40	600
6159-98	Processor Common Communications System (PCCS)	126
6136-95	DCP/20 Operating System	100
6136-01	DCP/40 Operating System	165
6136-00	DCP/40 DCP Emulate Operating System	114
6144-00	DCP/40 MCC Emulate Operating System	95
6276-00	BSC 3270 Terminal Handler	150
Data Base/Transaction Processing		
6292-98	Universal Data System (UDS) 1100 Control	250
6700-98	UDS Data Management System (DMS) 1100	1,200
6296-98	UDS Processor Common Input/Output System (PCIOS)	100
6293-98	UDS Relational Data Management System (RDMS) 1100	1,500
6299-98	UDS Data Dictionary System	750

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		Monthly Lease Charge ($)
Data Base/Transaction Processing (Continued)		
6177-98	Define File Processor	63
6175-96	Integrated Recovery Utility (IRU)	383
6175-95	IRU Version II	400
6175-94	IRU Version III	600
6291-98	File Administration System (FAS)	300
6155-98	Data Management System (DMS) 1100	956
6176-98	Data Dictionary	383
6152-98	Processor Common Input/Output System (PCIOS)	63
6283-00	Transaction Interface Package (TIP)	1,500
6244-98	Information Management System (IMS) 1100	195
6237-98	Display Processing System (DPS) 1100	289
End-User Products		
6146-97	Mapper 1100	978
6290-98	Advanced Information Service (Advise) 1100	300
6157-96	Query Language Processor (QLP) 1100	383
6156-98	Remote Processing System	252
Interactive Processing		
6170-98	Conversational Time-Sharing System (CTS) 1100	275
6147-98	High-Volume Time-Sharing (HVTS)	635
6262-98	Interactive Processing Facility (IPF) Command Language	275
6260-98	IPF Control	200
6263-98	IPF Procedures	350
6245-98	Edit 1100	290
6264-98	User Assistance	75
6261-98	Distributed Data Processing (DDP) 1100	100
Language Processors		
6165-98	General Syntax Analyzer	110
6172-98	APL 1100	509
6171-98	UBasic	126
6178-98	UBasic Syntax Analyzer	63
6153-98	ASCII Cobol	252
6149-98	Cobol Syntax Analyzer (BCOB)	126
6154-98	ASCII Fortran	383
6150-98	Fortran Syntax Analyzer (BFTN)	126
6151-98	PL/1	252
6164-98	RPG 1100	126
6251-97	RPG II Group	130
6160-98	MACRO	126
6294-00	Meta-Assembler (MASM)	1,000
6239-98	Programmers Advanced Debugging System (PADS) 1100	210
6251-98	Requirements and Development Processor (RDP)	1,000
Miscellaneous Products		
F3791-98	Univac Printer Interface Software (UPRINTS); provides interface to 0777 Printer	200
F3793-98	Cache Disk Interface Software (CADIS)	400
F3790-00	Compatible Channel Interface Software (COMPCIS)	400
6704-99	1100/91 Programming Aids/Extended Support Services (ESS)	925
6704-98	1100/92 Programming Aids/ESS	1,300
6704-97	1100/93 Programming Aids/ESS	1,500
6704-96	1100/94 Programming Aids/ESS	1,620 ■