

Sperry Univac System 80

MANAGEMENT SUMMARY

Introduced in April 1980, the Sperry Univac System 80 is a medium-range, general-purpose computer system with primary emphasis on ease of use and interactive operation. The System 80 uses the proven OS/3 software, augmented with a host of additional facilities, and effectively replaces the earlier Sperry Univac 90/25, 90/30, and 90/40 systems. The System 80, as compared to these older systems, is one-fifth the size, consumes less than half the power, is almost twice as fast, and costs about 50 percent less, according to Sperry Univac.

The System 80 utilizes state-of-the-art multiple-micro-processor architecture and emitter-coupled logic (ECL) circuits which promise high reliability and easy maintenance. It can be used effectively either as a standalone computer or as part of a distributed processing network. Moreover, it is designed for operation either in a computer room or in a controlled office environment. The basic processor complex requires only about 30 square feet of floor space.

The minimum System 80 equipment configuration consists of a processor complex with four integrated peripheral controls, 256K bytes of MOS memory, an integrated 118.2-megabyte fixed disk drive, a diskette drive, a console workstation, and a free-standing line printer. The basic processor complex also includes provisions for up to two data communications lines, a magnetic tape subsystem, and one additional peripheral control. The system can be expanded by connecting additional peripheral devices to any or all of the ▶

The System 80 is a workstation-oriented computer system designed for ease of use in interactive, batch, distributed processing, and remote computing operations.

MODELS: Model 3 and Model 5.

CONFIGURATION: CPU with 256K to 4096K bytes of main memory plus a maximum of 40 workstations, 8 disk drives, 4 diskette drives, 10 printers, 10 card reader/punches, 8 magnetic tape units, and 8 communications lines.

COMPETITION: Burroughs B 1900; Hewlett-Packard 3000; Honeywell Series 60 Level 62; IBM System/38, 4321, and 4331; and NCR 8400.

PRICE: Basic processor complexes can be purchased for \$59,261 to \$111,346.

CHARACTERISTICS

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

MODELS: System 80, Model 3 and Model 5.

DATE ANNOUNCED: April 16, 1980.

DATE OF FIRST DELIVERY: December 1980.

DATA FORMATS

BASIC UNIT: 8-bit byte. Each byte can represent 1 alphanumeric character, 2 decimal digits, or 8 binary bits. Two ▶



A minimum System 80 configuration consists of a central processor with 256K bytes of memory, a console workstation, an integrated 118-megabyte disk drive, a diskette drive, a printer, and associated control units. Magnetic tape drives, card reader/punches, and additional workstations, disk drives, diskette drives, and printers can be added.

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▷ integrated controls, and by adding the optional Input/Output Microprocessor (IOMP), which permits the connection of up to three additional peripheral controls and six additional data communications lines.

The System 80 central processor is offered in two models which are distinguished by the bandwidths of their 180-nanosecond control storage units: one word (of 32 data bits plus 4 parity bits) for the Model 3 and two words for the Model 5. The High-Performance Control Storage (HPCOS) used in the Model 5 gives it a 55 percent speed advantage over the Model 3. Sperry Univac rates the System 80 Model 3's CPU performance at about 1.15 times that of the Univac 90/30, and the Model 5's CPU performance at about 1.4 times that of the Univac 90/40.

Both the Model 3 and Model 5 processors have a basic main storage capacity of 256K bytes, which can be expanded to a maximum of 4096K bytes. The byte-addressable main storage is composed of 16K-bit MOS chips and has a cycle time of 400 nanoseconds per 4-byte access. Error correction code (ECC) logic provides automatic detection and correction of single-bit memory errors as well as detection of double-bit errors.

The basic System 80 processor complex includes a micro-processor-controlled disk channel/control and one 118.2-megabyte nonremovable disk drive. Up to seven additional disk drives can be added, in any combination of 118.2-megabyte nonremovable drives and/or 72.3-megabyte removable-pack drives. Each of the nonremovable drives can be equipped with an optional Fixed-Head feature that adds 860K bytes of storage with an average access time of only 8.8 milliseconds.

The principal input/output devices in most System 80 configurations will be keyboard/display units called workstations. Designed for ease of use in dialog-oriented interactive applications, each workstation consists of a typewriter-style keyboard and a 12-inch CRT screen with a 1920-character capacity. Up to 39 workstations, plus the system console, can be locally connected to the processor complex by means of cables up to 5000 feet long, and additional remote workstations can be connected via communications lines. The workstations can be operated in either of two modes. Workstation mode, the normal mode of operation, is used when communicating with application programs. System mode provides a direct interface to the OS/3 operating system, enabling the operator to make system inquiries, activate jobs, and perform other system functions.

Other input/output devices available for the System 80 include manual-load and autoloading diskette drives; line printers rated at 180, 300, 640, and 1200 lines per minute; a 300-cpm reader and a 75-to-160-cpm punch for 80-column cards; and the Uniservo 10 magnetic tape subsystem, which offers a maximum data transfer rate of 40,000 bytes per second.

A basic System 80 processor can control one or two data communications lines, and a system equipped with the ▷

▶ consecutive bytes form a 16-bit "halfword," four consecutive bytes form a 32-bit "word," and eight consecutive bytes form a 64-bit "doubleword."

FIXED-POINT OPERANDS: Can range from 1 to 16 bytes (1 to 31 digits plus sign) in decimal mode; 1 halfword (16 bits) or 1 word (32 bits) in binary mode. Certain operations use a doubleword (63-bit integer field plus sign) in binary mode.

FLOATING-POINT OPERANDS: Standard floating-point instructions provide for addition, subtraction, multiplication, division, loading, storing, and sign control of short or long format operands. The short format provides 24-bit precision and is represented by one word, which uses bit 0 for the sign, bits 1 through 7 for the exponent, and bits 8 through 31 for the fraction. Long format is represented with a doubleword which provides 56-bit precision; the long format is similar to the short format except that the fraction is contained in bit positions 8 through 63.

INSTRUCTIONS: 2, 4 or 6 bytes in length, specifying 0, 1, or 2 main storage addresses, respectively.

INTERNAL CODE: EBCDIC or ASCII, depending upon setting of a mode bit in the program status word by certain processor instructions. The processor is sensitive to zone fields and edit control characters.

MAIN STORAGE

STORAGE TYPE: MOS (metal oxide semiconductor), composed of 16K-bit chips.

CAPACITY: From 262,144 to 4,194,308 bytes for both models. Memory increments vary in size; see the "Equipment Prices" section at the end of this report.

CYCLE TIME: 400 nanoseconds per 4-byte access for both models.

CHECKING: Error correction code (ECC) logic provides automatic detection and correction of single-bit memory errors as well as detection of double-bit errors. Parity checking is also performed on both data and addresses.

STORAGE PROTECTION: The standard Storage Protect feature uses 15 keys to provide write or read/write protection for 1024-byte segments of main storage.

RESERVED STORAGE: The first (low-order) 640 bytes of main storage are reserved to hold specific operating information accessed by the hardware and the operating system.

CENTRAL PROCESSOR

The System 80 processor complex contains two modular processors: a control processor with an associated control storage unit, and a main storage processor which controls the main storage unit. The control processor performs arithmetic computations and contains the control logic required for instruction execution, system control, and I/O channel support functions in conjunction with the microinstructions residing in control storage. The control processor has 8 interrupt levels and a 4-byte (32-bit) internal data path width.

The processor architecture incorporates multiple LSI microprocessors and utilizes emitter-coupled logic (ECL) for high speed and reliable operation. Reliability is further enhanced by means of automatic instruction retry, parity generation and checking, and control storage error correction.

The two System 80 processor models differ primarily in the bandwidths of their control storage units: one 32-bit word ▶

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▷ Input/Output Microprocessor can support a total of eight lines. Each line can handle a data rate of up to 9600 bits per second and can accommodate either a single remote terminal or a multi-drop network configuration. A Single-Line Communications Adapter (SLCA) provides the appropriate interface between the System 80 and each line. SLCA's are currently available to support the following communications protocols: Binary Synchronous (BSC), Teletype (TTY), and Univac UDLC, Uniscope 100/200, UTS 400, and DCT 500.

The System 80 software is based upon the user-proven OS/3 operating system. Introduced in 1974 with the Univac 90/30, OS/3 has been extended and restructured to meet the varied information processing needs of the 1980's. It now supports batch, interactive, remote communications, and distributed processing environments, and features dynamic resource management and the ability to control up to 14 simultaneous jobs in a multiprogramming environment. As an example of OS/3's versatility, Sperry Univac points out that a distributor could prepare his inventory analysis in batch mode, perform his order entry applications interactively, use data communications to send picking lists to remote warehouses, and use distributed processing to allow regional sales offices to process the data needed for local control.

The Extended System Software, an optional extension of OS/3, adds six software tools that promise to enhance the ease and efficiency of System 80 operations. Especially noteworthy are the Screen Format Generator, which simplifies the programming of display screen formats for System 80 workstations, and the Dialog Specification Language, which facilitates the preparation of interactive dialogs between the system and its users.

The System 80 offers its users a choice of six programming languages—a striking contrast to the IBM System/38, which currently supports only the Cobol and RPG III languages. Cobol-74, Fortran IV, and Basic are all implemented in accordance with current American National Standards. RPG II is offered in an “industry-compatible” version that can compile RPG II source statements written for most IBM and Univac computers. Escort, introduced with the Univac BC/7 computers, is a high-level language for generating reports, processing transactions, making file inquiries, and maintaining data files. Basic Assembly Language (BAL) is a symbolic language that includes facilities for macroinstructions, procedural directives, and operand expressions. Programs written in any of the six languages can be developed interactively by System 80 users at workstations and remote terminals.

Transaction processing and data base management are facilitated by two major software tools. The System 80 Information Management System (IMS) is an interactive transaction processing system with integrated file management facilities. IMS includes an easy-to-use inquiry/update language, UNIQUE, and also supports ▷

▷ per 180-nanosecond cycle for the Model 3 processor and two 32-bit words per 180-nanosecond cycle for the Model 5. The faster control storage gives the Model 5 a 55 percent processing speed advantage over the Model 3. A Model 3 processor can be field-upgraded to a Model 5 by adding the High-Performance Control Storage (HPCOS) option.

REGISTERS: The System 80 control processor has the following register complement: 16 four-byte program registers, 16 four-byte supervisor registers, 16 four-byte control registers, and 4 eight-byte floating-point registers.

CONTROL STORAGE: The processor's operations are controlled by microprograms residing in a modular control storage element. The Model 3 control storage has a 180-nanosecond cycle time per one-word access and a capacity of 16,384 words, with each word consisting of 32 data bits plus 4 parity bits. The High-Performance Control Storage (HPCOS) used in the Model 5 processor has the same 180-nanosecond cycle time but accesses two words per cycle, has a capacity of 16,384 doublewords (i.e., 131,072 bytes), and yields a 55 percent increase in processing speed.

The control storage module also contains 1024 words of read-only storage, which provides the capability to perform initial microprogram loading and contains resident microdiagnostics for the central processor.

INSTRUCTION REPERTOIRE: The standard System 80 instruction set is an “inclusive superset” of the Univac 90/30 instruction set. It consists of 128 instructions, including 44 floating-point arithmetic instructions as well as decimal arithmetic, fixed-point binary arithmetic, code conversion, logical operations, packing, unpacking, editing, shifting, testing, and branching. Instructions are two, four, or six bytes in length and use one of six formats: Register to Register (RR), Register to Indexed Storage (RX), Register to Storage (RS), Storage (S), Storage and Immediate Operand (SI), or Storage to Storage (SS).

INSTRUCTION TIMES: Times for individual System 80 instructions have not been published to date. Sperry Univac states, however, that the CPU performance of the System 80 Model 3 is about 15 percent greater than that of the Univac 90/30, and that the CPU performance of the System 80 Model 5 is about 40 percent greater than that of the Univac 90/40.

CONFIGURATION RULES

The minimum System 80 configuration consists of a processor complex plus a free-standing printer and a diskette drive. The processor complex, in turn, consists of a control processor, a main storage processor with 256K bytes of memory, a disk channel/control and one integrated 118.2-megabyte nonremovable disk drive, a diskette control, a workstation control and one console workstation, and a paper peripheral control which controls the printer.

The basic System 80 can be expanded by connecting additional peripheral devices to any or all of the four integrated controls. The disk channel/control can control up to seven additional disk drives of the fixed or removable-media type. The diskette control can handle up to three additional drives. The workstation control accommodates up to seven additional local workstations. The paper peripheral control can handle a second printer and either two card readers or one card reader and one card punch. The basic processor complex also includes provisions for a magnetic tape control, one or two data communications lines, and one additional peripheral control.

The system can be further expanded by adding field-installable modules which increase its I/O capabilities, processing speed, and/or storage capacity. The Input/ ▷

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➤ application programs coded in Cobol, RPG II, or BAL. The Database Management System (DMS) is a CODASYL-compatible system that permits simultaneous access to shared data bases by multiple users in any combination of batch, transaction, and time-sharing programs. Interfacing between DMS data bases and the IMS transaction processing system can be accomplished in several ways, depending upon the user's requirements.

Data communications functions are controlled by the ICAM (Integrated Communications Access Method) Terminal Support Facility, which provides concurrent support for multiple user programs communicating with a variety of terminals and line types. The Distributed Processing Transfer Facility handles job distribution and file transfer operations among multiple OS/3 computers in different locations. Other communications software products facilitate the use of Univac UTS 400 and UTS 4000 programmable terminals with the System 80, and enable a System 80 to act as a remote terminal to a Univac 1100 Series computer. The Remote Terminal Processor enables a System 80 to interface to an IBM system as a multileaving workstation using BSC protocol. A new IBM 3270 Emulator program is also available.

Sperry Univac currently offers six application software products, all designed to take advantage of the System 80's orientation toward interactive processing. UNIS 80 is an interactive version of the UNIS manufacturing control system that is currently in use at several hundred Univac 1100 Series and 90 Series installations. UNIDIS—Wholesale is an interactive distribution control system for both wholesale and retail distributors. Order Entry 80 is an interactive customer order processing system. Information Collection System 80 (ICS 80) is an on-line data entry system that supports multiple display terminals. Accounting Control System 80 (ACS 80) is a series of RPG-coded modules that handle the basic business accounting functions: accounts receivable, accounts payable, general ledger, and payroll. The ACS 80 modules can be interfaced to ICS 80 for on-line data entry and to IMS for on-line file inquiry. The Apparel Information System provides functions such as order entry and inventory control for the apparel industry.

The System 80 is fully compatible with Sperry Univac's earlier OS/3-oriented computers—the 90/25, 90/30, and 90/40. As such, it also offers a high degree of compatibility with the earlier Univac 9000 Series computers, the IBM System/360 and 370, and many of the other byte-oriented systems currently on the market.

The IBM System/3 is a primary marketing target of the System 80, and the conversion process is facilitated by the availability of a System/3-compatible RPG II compiler, sort package (SORT3), disk access method (MIRAM), utility functions, and OCL processor. To bridge the remaining areas of incompatibility between the two systems, Sperry Univac also offers a disk data file conversion procedure and transcribers for System/3 Model 10, 12, and 15 source and proc libraries. ➤

➤ **Output Microprocessor (IOMP)** permits the connection of up to three additional peripheral controls and six additional data communications lines. The High-Performance Control Storage (HPCOS) facility replaces the basic control storage unit and increases the CPU's processing speed by 55 percent. HPCOS is a standard feature of the System 80 Model 5 and can be added to the Model 3 to upgrade it to a Model 5.

Main memory on the System 80 processors can be expanded to a maximum of four megabytes. Expansion is accomplished in one of two ways. New customers can order a System 80 processor with 1.5 megabytes of main memory expandable to 4.0 megabytes in 0.5-megabyte increments. Customers with existing installations can order memory modules with 0.25, 0.75, 1.0, or 1.25 megabytes as needed to expand the system to 1.5 megabytes. Beyond 1.5 megabytes, expansion is in 0.5-megabyte increments.

The basic and expanded System 80 configuration parameters can be summarized as follows:

	<u>Minimum</u>	<u>Expanded System</u>
Main storage capacity	256K bytes	4096K bytes
Disk storage drives	1 (fixed)	8 (fixed and/or removable)
Diskette drives	1	4 (2 of which may be autoload)
Workstations	1 (console)	8 (40 with additional controls)
Printers	1	2 (10 with additional controls)
Card readers/punches	0	2 (10 with additional controls)
Magnetic tape units	0	8
Communications lines	0	8
Unassigned I/O ports	1*	4*

*May be used to connect additional workstation controls, paper peripheral controls, or remote printer attachments.

INPUT/OUTPUT CONTROL

As noted above, the basic System 80 processor complex includes an integrated disk channel/control, diskette control, workstation control, and paper peripheral control, plus additional I/O ports for a magnetic tape control, two communications lines, and one additional I/O control (which may be a workstation control, paper peripheral control, or remote printer attachment). The optional Input/Output Microprocessor (IOMP) provides ports for up to three additional peripheral controls and six additional communications lines.

The disk channel/control provides a direct, microprocessor-controlled interface to main storage and accommodates a data transfer rate of up to 1.1 megabytes per second. All other peripheral controls are interfaced to main storage through either the central microprocessor or the IOMP. The maximum aggregate system data rate is 6.0 megabytes per second.

MASS STORAGE

DISK STORAGE: The System 80 features an integrated, microprocessor-controlled disk channel/control (DC/C) that directly accesses main storage and accommodates up to eight disk drives. One nonremovable 118.2-megabyte disk drive is included in every System 80 configuration, and up to seven additional drives using either removable or nonremovable disks can be added. The DC/C provides error checking and recovery facilities for error bursts of up to five bits, and has a maximum data rate of 1.1 megabytes per second.

Each of the nonremovable disk drives has a storage capacity of 118.2 megabytes. There are sixty 256-byte records per track, 14 tracks per cylinder, and 550 cylinders per disk. Average positioning time is 35 milliseconds, average rotational delay is 8.8 milliseconds, and the data transfer rate ➤

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➤ Other conversion aids, including language translators and file transcribers, are available to facilitate conversions to the System 80 from the Univac 9200 and 9300; the OS/4-oriented Univac 9400 and 9480; the IBM System/32 and System/34; the Honeywell Series 100, 200, and 2000; and the Honeywell Series 60, Levels 62 and 64.

The System 80 competes directly against three formidable IBM computers, the System/38, the 4321, and the 4331, as well as against a host of other medium-range systems from vendors such as Burroughs, Hewlett-Packard, Honeywell, and NCR. The System/38 features interactive operation, virtual storage, and integrated data base support. The 4331 is a more conventional, batch-oriented system that uses the proven System/370 hardware and software concepts. The 4321, introduced by IBM in November 1981, is an entry-level, workstation-oriented system. The System 80 is said to be closely comparable in CPU performance to the System/38, 4321, and 4331. It also offers the capability to handle a broad range of both interactive and batch applications.

USER REACTION

Only one System 80 user responded to Datapro's 1981 survey of general-purpose computer users, but in December we located five additional users and asked them to rate the system also. These six users represented a manufacturer, a retailer, a distributor, and three educational institutions. The systems had been in operation for two to nine months. The number of workstations per system ranged from 2 to 12, and 2 users planned to add additional workstations.

Five of the six users had converted from older systems— one from an IBM System/3, two from Sperry Univac 90/30s, one from a Sperry Univac 9200, and one from a Sperry Univac 9300. None of the users reported any significant problems during the conversion process.

The table below summarizes the users' ratings of the System 80.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	4	2	0	0	3.66
Reliability of mainframe	2	2	1	0	3.20
Reliability of peripherals	2	3	0	0	3.40
Maintenance service:					
Responsiveness	4	1	0	1	3.33
Effectiveness	4	2	0	0	3.66
Technical support:					
Trouble-shooting	1	4	0	0	3.20
Education	1	5	0	0	3.16
Documentation	1	2	3	0	2.66
Manufacturer's software:					
Operating system	3	2	1	0	3.33
Compilers & assemblers	3	2	0	0	3.60
Application programs	1	3	0	0	3.25
Ease of programming	3	2	1	0	3.33
Ease of conversion	3	1	1	0	3.40
Overall satisfaction	3	3	0	0	3.50

*Weighted Average on a scale of 4.0 for Excellent.

➤ is 1.1 megabytes per second. The first nonremovable disk drive is packaged within the processor cabinet, and up to three additional drives are packaged in a single free-standing cabinet.

The nonremovable disk drives can be equipped with an optional Fixed-Head feature that adds 56 fixed read/write heads serving an additional 860,160 bytes of storage. Average access time to this storage is only 8.8 milliseconds.

The removable disk drive is a free-standing unit that uses interchangeable, 4-platter disk packs with a storage capacity of 72.3 megabytes each. There are fifty 256-byte records per track, 7 tracks per cylinder, and 808 cylinders per disk. Average positioning time is 33 milliseconds, average rotational delay is 10.7 milliseconds, and the data transfer rate is 780 kilobytes per second.

DISKETTES: A diskette subsystem, consisting of a diskette control and from one to four drives, is a standard component of every System 80. A microprocessor controls and buffers all diskette operations. Several diskette recording formats are available, including the IBM-compatible Basic Data Exchange (BDE) format, with 128 bytes per sector, 256 kilobytes per diskette, and a 31 KBS data transfer rate; and the Sperry Univac double-density format, with 256 or 512 bytes per sector, 1 megabyte per diskette, and a 62 KBS data rate.

Manual and autoloader diskette drives can be intermixed. A system can have one, two, or four manual diskette drives or one or two autoloader diskette drives. Furthermore, a manual drive can be configured with each autoloader drive. A single diskette cabinet can hold up to four manual drives or one autoloader and one manual drive.

The autoloader diskette drive allows automatic processing, in sequential order, of up to 20 standard diskettes. The operator simply places the diskettes into the unit's hopper and then removes them from the stacker. The loading or unloading time is a maximum of five seconds per diskette.

INPUT/OUTPUT UNITS

WORKSTATIONS: The basic System 80 configuration includes a console workstation and a microprocessor-based workstation control that can accommodate up to seven additional workstations. A system equipped with the Input/Output Microprocessor can handle up to four additional workstation controls, each controlling a maximum of eight workstations. The workstations are cable-connected to the processor complex and can be located up to 5000 feet (1524 meters) away from it. The control unit contains dedicated buffers for each workstation, allowing the workstations to transfer data concurrently through a serial interface at a data rate of 9600 bits per second.

The System 80 workstation is a keyboard/display unit designed for ease of operation. A 12-inch CRT displays 24 lines of data plus a system status line, and each line can contain up to 80 characters. Three keyboard arrangements are available: standard typewriter, typewriter plus numeric and function pads, and Katakana/English. Each keyboard also contains 33 control keys that provide considerable operating flexibility, including cursor scanning, character insertion and deletion, protected characters, blinking, selective erasure, and reverse video.

By pressing a function key, the operator can cause a workstation to operate in either of two modes. Workstation mode, the normal mode of operation, is used when communicating with application programs. System mode provides a direct interface to the OS/3 operating system, enabling the operator to make system inquiries, activate jobs, and perform other system functions.

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► Except for the Documentation category, the ratings show a high degree of user satisfaction with the System 80. Two of the users stressed ease of operation as a major advantage of the System 80, and two mentioned interactive processing as a key feature of the system. One of these users, who had converted from a 90/30, also said that the employees were happy with the System 80 because "the room doesn't need to be kept as cold."

In one educational institution, the System 80 represented the organization's first in-house computer. This user said he liked the system because it is "very easy to work with, can do both batch and interactive processing, and can handle many applications at once." However, he said that the OS/3 operating system and the IMS software "are not as easy to use as they could be."

Another user, who rated the System 80 as Excellent in all but two categories, said "delivery of the equipment and software was ahead of schedule, system costs were less than expected, and the system is easy to expand."

All six of the users said they would recommend the System 80 to others. However, one user qualified his answer by saying that he would "recommend the equipment, but not the vendor." He said "the system is excellent," but he is "not happy with Univac's performance." None of the other users expressed any dissatisfaction with Sperry Univac's service.□

► The console workstation is a specially adapted workstation that can perform all the standard workstation functions, as described above, plus the additional functions required to control and maintain the system. It can be switched into any of five operating modes and can serve as a normal workstation, as a system control console, or as a maintenance console.

LINE PRINTERS: Sperry Univac offers four horizontal-band line printers for the System 80. Their rated speeds with a 48-character set are 180, 300, 640, and 1200 lines per minute. Each paper peripheral control can support one or two line printers with a combined print capacity of up to 1500 lines per minute. In addition, a remote printer attachment permits the connection of one 180-, 300-, or 640-lpm printer located up to 5000 feet (1524 meters) away from the processor complex.

All four of the printers feature a vertical format buffer, vertical spacing of either 6 or 8 lines per inch, and a wide variety of print bands or cartridges to satisfy different language and application requirements. The 1200-lpm printer has 136 print positions, while the other three models have 132. Form dimensions for the 1200-lpm printer can range from 4 to 18.75 inches in width and from 1 to 18 inches in length; the other three models accept forms from 3 to 15 inches wide and from 1 to 22 inches long.

MATRIX PRINTERS: Three models are available. Use of the 0797-99 and 0798-99 matrix printers is limited to off-line screen dumps under workstation control. The 0798-68 printer can be operated with the paper peripheral control or the remote printer attachment, but an 0789 or 0776 line printer is prerequisite. The 0797-99 is an 80-cps impact printer that prints unidirectionally over a print width of 80 columns. Characters are formed by a 9-by-7 half-space dot matrix. Eight different 96-character sets featuring various font styles and language symbols (standard ASCII, plus several European languages), as well as a 128-character Katakana set,

are offered. Horizontal spacing is 10 characters per inch; vertical spacing is selectable at 6 or 8 lines per inch. Vertical format controls provide for nine industry-standard form lengths from 3 to 12 inches, plus continuous feed. A friction feed platen that accommodates cut forms up to 8.5 inches wide is standard.

The 0798-68 and 0798-99 are 200-cps printers that print bidirectionally over a print width of 132 columns. Characters are formed by a 7-by-7 half-space dot matrix. Several character sets, including a 64- and a 96-character ASCII set and various European character sets are offered. Horizontal spacing is 10 characters per inch; vertical spacing is 6 lines per inch. Options available for the 0798-99 printer include a 7-by-9 dot matrix for ASCII character sets, 14-cpi compressed printing, operator selection of 6 or 8 lines per inch, and a document parting bar.

CARD EQUIPMENT: Although the System 80 is strongly oriented toward interactive processing, an 80-column card reader and card punch are available. The card reader is a table-top device rated at 300 cards per minute. The card punch is a free-standing device rated at 75 cpm when punching all 80 columns or at 160 cpm when punching only the first 28 columns of each card. The punch can be equipped with an optional pre-punch read station. Each paper peripheral control can support either two card readers or one card reader and one punch.

MAGNETIC TAPE: The only magnetic tape subsystem currently available for the System 80 is the Uniservo 10, a low-speed, low-cost subsystem that reads and records data on standard 1/2-inch tape in IBM-compatible formats. The Uniservo 10 tape drive is offered in three models:

- 9-track phase-encoded; transfer rate is 40 kilobytes per second at a recording density of 1600 bpi.
- 9-track dual-mode; transfer rate is 40 kilobytes per second at a density of 1600 bpi in phase-encoded mode, or 20 kilobytes per second at a density of 800 bpi in NRZI mode.
- 7-track NRZI; transfer rate is 20, 13.9, or 5 kilobytes per second at a density of 800, 556, or 200 bpi, respectively.

All models of the Uniservo 10 operate at a tape speed of 25 inches per second, read forward and backward, feature automatic tape loading, and accommodate industry-standard wraparound tape cartridges.

A Uniservo 10 subsystem consists of a prime tape unit, with built-in controller, plus up to seven additional tape units. The tape subsystem is connected to a special port in the processor complex.

COMMUNICATIONS CONTROL

In addition to the directly connected workstations, a basic System 80 can support one or two communications lines. A system equipped with the Input/Output Microprocessor can support up to six additional lines, for a total of eight lines. Data can be transmitted at up to 9600 bits per second over each line. An appropriate Single-Line Communications Adapter (SLCA) provides the interface between the System 80 and each line. The SLCA performs integrity checking, special character recognition, and data transfer control. SLCA's are available to support the following communications protocols and Sperry Univac terminals:

- Univac Uniscope 100/260 and UTS 400; 2000 to 9600 bps data rate; half or full duplex, synchronous mode; RS-232C/X.21.BIS or MIL-188-100 interface; provides auto answer; requires external clock.
- Teletype/Univac DCT 500; up to 9600 bps data rate; half duplex, asynchronous mode; RS-232C/X.21.BIS or MIL-188-100 interface; provides auto answer; has internal clock. ►

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- • Universal Data Link Control (UDLC); 2000 to 19,200 bps data rate; half or full duplex, synchronous mode; RS-232C/X.21.BIS interface; provides auto answer; requires external clock.

SOFTWARE

OPERATING SYSTEM: Software support for the System 80 is based upon Sperry Univac's proven *OS/3* operating system, extended and restructured to provide effective support for batch, interactive, remote communications, and distributed processing environments.

The *OS/3* supervisor consists of memory-resident and disk-resident transient routines that provide the central control, coordination, and resource allocation required for efficient system utilization. Supervisor functions include interrupt servicing, task switching, physical I/O control, transient management, timer and day clock service management, console and workstation management, error logging and recovery, and memory management.

The *OS/3* job control facilities allow the definition, initiation, and control of up to 14 simultaneous jobs with up to 256 subtasks per job step. Jobs and tasks are scheduled in response to job control language (JCL) statements entered from the system console, workstations, or remote terminals. An interactive prompting facility simplifies the creation of JCL statements and job streams. Previously stored JCL procedures can be varied at run time.

OS/3 includes a consolidated data management system that serves as the controlling interface between application programs, the system hardware, and *OS/3*. There are separate access methods for disks, diskette, workstation, magnetic tape, and unit record input/output. The logical input/output control system (IOCS) modules that control each access method are shareable subroutines that are dynamically loaded into main memory when required. Access to disk files is controlled by the Multiple Indexed Random Access Method (MIRAM), a single access method that provides four ways of accessing disk records: sequentially in order of placement, sequentially by ascending key, randomly by multiple keys, or randomly by relative record number. The diskette access method permits the records on a diskette file to be accessed sequentially in order of placement, randomly by relative record number, or by data set labels. Card, printer, and diskette subsystems can be accessed either directly or through the optional Spooling facility.

The basic *OS/3* System Control Software (SCS) includes a number of bundled system service programs. Among these are two program librarians; a linkage editor; disk, diskette, and tape initialization routines; system and user dump routines; two print utilities; a catalog manipulation utility; a disk dump/restore utility; a system patch routine; and system installation facilities; a security maintenance utility; and a system activity monitor.

EXTENDED SYSTEM SOFTWARE: This optional, separately priced extension of *OS/3* provides six additional software components that significantly enhance the utilization and operation of the System 80. These components are described in the following paragraphs.

The *Screen Format Generator (SFG)* is designed to facilitate the programming of screen formats for System 80 workstations by enabling users to create, modify, and delete formats and maintain the files in which these formats are stored. Prompting at each step of the process is optional. Formats generated by the SFG are independent of user programs, and can be changed without necessitating recompilation of the programs. The stored formats can be either shared with other users or restricted.

The *Dialog Specification Language (DSL)* is a high-level language designed to facilitate the creation of interactive dialogs between the System 80 and its users. Each dialog is a series of questions to which the user at a workstation or remote terminal responds with appropriate information. DSL allows the programmer to specify the dialog structure, format and mapping rules, and record structure. The DSL translator processes the specifications and stores the resulting dialog. The *OS/3* Dialog Processor responds to requests to display prefiled dialogs, extracts the data entered in response to the dialog queries, and routes the data to the appropriate user programs.

The *Data Utility* is a versatile utility program for reproducing and maintaining data files on cards, tape, disk, or diskette. Statements describing the files and the desired processing are entered either through a job control stream (in batch mode) or in response to screen prompts (interactively). The *Data Utility* can compare files, insert or delete records, edit records, transfer existing files to other types of devices, produce a printed copy of any file, etc.

SORT/MERGE can operate either as an independent sort/merge program defined and initiated by JCL statements, or as a modular sort/merge subroutine integrated into user programs. Input and output to the sort or merge may be on disk, diskette, or magnetic tape, and work files may be on either disk or tape. Blocked or unblocked records of fixed or variable length can be sorted in ascending or descending sequence. Up to 255 key fields can be specified, and the key fields can have any of 7 formats.

SORT3 is an IBM System/3-compatible sort program that can sort and reformat selected records from as many as nine input files on cards, tape, disk, or diskette. *SORT3* can perform full-record sorts, tag sorts, and summary sorts.

The *Spooling and Job Accounting* facility increases system throughput by transferring data between low-speed peripheral devices and disk storage independently of the programs that use the data. Both input spooling and output spooling are provided. Job accounting information for each job that runs on the system is generated as part of the spooling function. Special programs are provided to process this information and produce a detailed job accounting report.

PROGRAMMING LANGUAGES: System 80 users will have a choice of six programming languages: Cobol, Fortran IV, Basic, RPG II, Escort, and BAL.

The *OS/3 Cobol* compiler conforms to the specifications of American National Standard Cobol X3.23-1974. The following standard Cobol language modules are implemented, all at Level 2: Nucleus, Table Handling, Sequential I/O, Relative I/O, Indexed I/O, Sort, Segmentation, Library, Debug, Inter-Program Communications, and Communications. In addition, the compiler contains a number of useful extensions, including a non-English language feature and an extended program test facility.

The *OS/3 Fortran IV* compiler implements the ANS Fortran X3.9-1966 language, together with numerous extensions designed to provide compatibility with IBM DOS Fortran IV and Sperry Univac Series 70 Fortran. Direct-access files, formatted screen services, and debugging and diagnostic features are available.

OS/3 Basic is an interactive programming system that is compatible with Dartmouth Basic and with American National Standard Minimal Basic X3.60-1978, with extensions. Files, subprograms, string handling, chaining, and user-defined functions are supported. Basic source programs can be entered and compiled interactively, and syntax errors can be corrected immediately. During a single interactive Basic session, a user can enter, modify, execute, and save programs. ►

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► **OS/3 RPG II** is an industry-compatible report program generator with extensions designed to facilitate programming and maintenance. It can compile RPG II source statements written for the IBM System/3, System/360, and System/370 computers and for the Univac 9200, 9300, 9400, and 9480. Significant extensions include an Auto Report facility that simplifies RPG II programming, IMS "action program" support, workstation support, a formatted error analysis capability, and an RPG II Editor that facilitates the creation and editing of RPG II programs from a workstation or terminal. The System 80 Editor is a prerequisite to the utilization of the RPG II Editor facility.

Escort is a high-level language, introduced with the Univac BC/7 computers, that facilitates the preparation of programs for generating reports, entering data, processing transactions, making file inquiries, and maintaining data files. The Escort system features two modes of operation. In the Tutorial mode, the novice user is guided through the program development process by means of extensive prompting and diagnostics. The Program mode permits more experienced users to enter programs more rapidly, and they can revert to the Tutorial mode whenever problems are encountered.

Basic Assembly Language (BAL) is a versatile symbolic language that gives the user full control of the System 80 hardware facilities by providing a mnemonic code for each machine instruction. BAL also provides facilities for macro instructions, procedural directives, and operand expressions.

EDITOR: The System 80 Editor is an interactive facility for creating, copying, and merging files and for adding, deleting, and modifying text. It provides convenient commands for creating and updating records in data files, library files, and spool files. File protection facilities prevent a file being modified by the Editor from being destroyed or incorrectly altered either by direct user action or through a system failure.

INFORMATION MANAGEMENT SYSTEM: The System 80 Information Management System (IMS) is an interactive transaction processing system with integrated file management facilities. It includes an inquiry/update language, UNIQUE, that is designed for general-purpose file processing and requires no programming knowledge. IMS also supports application programs written by the user in Cobol, RPG II, or BAL. Programming is simplified because IMS handles all the communications and file I/O functions.

IMS is transaction-oriented. Processing is triggered by a message from a workstation or remote terminal. Application programs, called "action programs," process the input message, access data files as necessary, and return the appropriate response to the terminal. IMS allocates the system resources, schedules the required action programs, and provides file protection through a record locking facility and both on-line and off-line recovery provisions.

IMS can access conventional files, specially defined files, or DMS data bases. It supports the processing of transactions in batch mode as well as in the normal interactive mode. Input to IMS can come from any interactive workstation or terminal. Terminals can either be dedicated to IMS or dynamically connected and disconnected during an on-line session. Messages can be sent from one IMS terminal to another. Extensive recovery facilities can be utilized without user programming. IMS is now available in both single-thread and multi-thread versions. Extended System Software is a prerequisite to IMS.

DATABASE MANAGEMENT SYSTEM: DMS is Sperry Univac's CODASYL-compatible data base management system for the System 80 computers. It consists of a collection of programs designed to handle the description, initialization,

creation, accessing, maintenance, backup, and recovery of data bases.

DMS has four major components: the Data Description Language (DDL), Data Manipulation Language (DML), Data Base Management System (DBMS), and Data Base Utilities. The DDL enables users to define a data base and various "views" of the data base. The data base can be accessed by means of DML statements in the Procedure Division of Cobol application programs. The DBMS allows concurrent access to the shared data base by multiple users in any combination of batch, transaction, and time-sharing programs. The Data Base Utilities include routines for loading and dumping the data base, reporting, printing, initialization, and off-line recovery. A more detailed description of DMS can be found in Report 70E-877-01.

Interfacing between DMS and the IMS transaction processing system can be accomplished in several ways. DMS data bases can be accessed by Cobol-coded IMS action programs through DML statements embedded in the programs. Alternatively, DMS data bases can be used to build IMS "defined files" which are accessible via the UNIQUE inquiry/update language or via IMS action programs coded in Cobol, RPG II, or BAL. The Extended Systems Software and Cobol are prerequisites to DMS.

COMMUNICATIONS SOFTWARE: The *ICAM (Integrated Communications Access Method) Terminal Support Facility* is a modular component of OS/3 that provides concurrent support for multiple user programs communicating with a variety of terminals and line types. ICAM controls the physical input/output operations between the System 80 processor and the Single-Line Communications Adapters (SLCAs), and performs the following functions: message queuing, multiple destination routing, activity scheduling and priority control, timer service, checkpoint/restart procedures, journal control, and accumulation of message and error statistics.

The user can choose the required level of ICAM support at system generation time. There are four available interfaces between the user's message processing programs and the ICAM modules, and each interface contains its own unique set of macroinstructions. The Standard Interface is a conventional GET/PUT communications interface that automatically queues input and output messages in network buffers. The Transaction Control Interface is specifically designed for efficient processing of transaction programs in conjunction with IMS. The Direct Data Interface permits users' programs to interface directly with the ICAM remote device handlers. The Communications Physical Interface provides an interface between ICAM and users' programs at the physical I/O level, which may save main storage but shifts most of the communications programming effort to the user.

The *NTR (Nine Thousand Remote) System Utility* enables a System 80 to act as a remote batch terminal to a Sperry Univac 1100 Series computer system. NTR is controlled by macro-instructions and console directives, and it can run concurrently with other System 80 jobs. The ICAM Terminal Support Facility is a prerequisite.

The *Distributed Data Processing Transfer Facility* permits the distribution and cooperative processing of user jobs and files among multiple OS/3-supported computers in different locations. The user can view each node in his distributed processing network as an available resource for scheduling and executing his work. Using straightforward commands, he can initiate job distribution and file transfer operations without regard for the intricacies of the hardware, software, and communications protocols involved. The Extended System Software, ICAM Terminal Support Facility, and either the DCA Termination Systems or one of the Packet-►

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- Switched Public Data Network Systems are prerequisites to the Distributed Data Processing Transfer Facility.

The *Distributed Data Processing File Access Facility* enables user programs to access files resident on remote OS/3 systems via Sperry Univac's UDLC communications protocol. Program-to-program communications are also supported. The DDP File Access Facility requires the ICAM Terminal Support Facility and either the DCA Termination Systems or one of the Packet-Switched Public Data Network Systems.

The *Distributed Data Processing IMS Transaction Processor* enables transactions created by a workstation operator or IMS action program to be routed between OS/3-supported systems. IMS integrated recovery facilities are provided for system integrity control. Prerequisites are the IMS Multi-Thread system, ICAM Terminal Support Facility, and either the DCA Termination Systems or one of the Packet-Switched Public Data Network Systems.

The *Remote Terminal Processor* permits a System 80 processor to interface to an IBM system as a multileaving workstation using BSC protocol. The ICAM Terminal Support Facility and Extended System Software are required.

The *IBM 3270 Emulator* provides an interface that permits a System 80 to emulate a 3270 terminal. The ICAM Terminal Support Facility and Extended System Software are prerequisites.

The *DCA Termination Systems* are facilities that establish and control a DCA communications network and permit a communications program to establish a session with terminals or programs on other systems. The ICAM Terminal Support Facility and Extended System Software are required.

Six *Packet-Switched Public Data Network Programs* are available to provide an interface to the following foreign data networks: the German Datex-L and Datex-P networks, the French Transpac network, the Canadian Datapac network, and the Japanese DDX-C and DDX-P networks. All six programs require the ICAM Terminal Support Facility.

A *UTS 400 Cobol Compiler, Edit Processor, and Load/Dump Facility* are provided to facilitate the use of the Sperry Univac UTS 400 Universal Terminal System with the System 80. These software products enable the System 80 to be used for efficient creation, maintenance, and loading of UTS 400 programs and data files.

The *UTS 4000 Loadable Character Set Generator* provides a means of generating user-defined character sets to be used with the loadable character set hardware feature on Sperry Univac UTS 40 single-station terminals. Users have the option of starting with an existing character set already defined for the UTS 40 or creating a new character set. The UTS Load/Dump Facility and ICAM Terminal Support Facility are required.

CONVERSION AIDS: Sperry Univac is marketing the System 80 as a replacement for a number of older small computer systems, and is offering appropriate software aids to simplify the conversion process.

For *Univac 9200/9300* users, the OS/3 RPG II compiler can be operated in a 9200/9300 mode that permits direct compilation of 9200/9300 RPG source programs, and 9200/9300 sequential tape files can be processed directly by OS/3 programs. To bridge the remaining areas of incompatibility, Sperry Univac offers a 9200/9300 data file transcriber, assembly language translator, Cobol and COPY translator, and library transcriber.

For *Univac 9400/9480* users operating under OS/4, OS/3 offers a high degree of compatibility. Most OS/4 RPG and Fortran source programs can be recompiled by the OS/3 compilers with little or no change. Available conversion aids include an OS/4 JCL translator, assembly language translator, Cobol and COPY translator, data file converter, and library transcriber.

For *IBM System/3* users, OS/3 provides a System/3 mode on the RPG II compiler that permits direct compilation of System/3 source programs, a System/3-compatible sort (SORT3), a disk access method (MIRAM) that is compatible with the System/3 disk access method, compatible utility functions, and an OCL processor that accepts System/3 OCL control streams. Available conversion aids include a System/3 disk data file conversion procedure, a Model 10 source and proc transcriber, and a Model 12/15 source and proc transcriber.

For *IBM System/32 and System/34* users, the OS/3 RPG II compiler provides a high degree of source-language compatibility. Conversion aids include procedures for transcribing System/32 and System/34 data files and source and proc libraries to OS/3 formats.

For *Honeywell 100 Series* users, Sperry Univac offers a Cobol translator and a data file transcriber.

For *Honeywell 200/2000 Series* users, available conversion aids include a Cobol translator, an Easycode converter, and a data file transcriber.

For *Honeywell Level 62 and Level 64* users, conversion to a System 80 is facilitated by a Cobol translator and a program library and data file transcriber.

APPLICATION PROGRAMS. Sperry Univac currently offers six application software systems for the System 80 computers operating under OS/3.

Univac Industrial System 80 (UNIS 80) is a comprehensive production and inventory control system. It provides production engineering data management, product costing, customer order processing, inventory status and control, forecasting and analysis, master scheduling, materials requirement management, production planning, and work order management. The system provides both interactive and batch features and uses data base technology. It is available in both a ready-to-use version (UNIS 80) and in an extended, source-code version (UNIS 80-E) that provides additional functions.

Accounting Control System 80 (ACS 80) is a series of packaged applications written in RPG II for general business accounting functions. Four separate modules are available: Accounts Receivable, Accounts Payable, General Ledger, and Payroll. All four modules offer on-line data entry and inquiry capabilities. The on-line functions are performed by ICS 80 (below) and IMS/UNIQUE.

Information Collection System 80 (ICS 80) is an on-line data entry system designed to permit efficient collection of data through multiple display terminals. A broad range of data validation and field processing features is provided. ICS 80 can operate simultaneously with other jobs in a multi-programming environment. ICAM and IMS are prerequisites.

Order Entry 80 is an interactive customer order processing system. Its functions include customer information management, customer and part searching, order entry and control, pricing, stock availability checking and reservation, back order generation and control, picking lists, shipping documents, and invoicing. The system is available in both a

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► ready-to-use version and an extended, source-code version called Order Entry 80-E.

Univac Distribution Information System—Wholesale (UNIDIS—Wholesale) is a comprehensive distribution control system that encompasses separate subsystems for order entry and processing, stock control, and inventory management. UNIDIS is an on-line, data base-oriented system, written in Cobol, that provides on-line or batch order entry, pre- and post-billing, picking lists, picking confirmation, shipping notices, invoicing, back orders, credit checking, purchase orders, warehouse receiving, demand forecasting, forecast model selection, suggested order quantities, safety stock control, and inventory management simulation.

Apparel Information System provides on-line and batch facilities for the apparel industry. Functions include order entry, order allocation, inventory control, production planning, work-in-process reporting, raw material requirements planning, invoicing, sales and booking reports, pick slip registers, and management reports and screen formats.

PRICING

EQUIPMENT: All necessary control units and adapters are included in the indicated prices for the following configurations, and the quoted one-year rental prices and five-year lease prices include equipment maintenance. *Excluded* from the quoted equipment prices, however, are the \$105 monthly system support fee and all separately priced software products.

MINIMUM MODEL 3 SYSTEM: Consists of Model 3 processor complex (256K bytes) plus Model A keyboard, head/disk assembly, manual-load diskette drive, and 180-lpm printer with print band. Purchase price is \$74,853, monthly rental on a one-year contract is \$2,499, and monthly rate on a five-year lease is \$2,066.

DUAL-WORKSTATION MODEL 3 SYSTEM: Consists of Model 3 processor complex (256K bytes) plus one additional workstation, two Model B keyboards, head/disk assembly, autoloader diskette subsystem with manual-load expansion drive, and 300-lpm printer with print band. Purchase price is \$84,620, monthly rental on a one-year contract is \$2,822, and monthly rate on a five-year lease is \$2,340.

18-WORKSTATION MODEL 5 SYSTEM: Consists of Model 5 processor complex (1.5 megabytes) plus 17 additional workstations, 18 Model B keyboards, disk cabinet and two additional fixed-media disk drives (354 megabytes total), three head/disk assemblies, one local 640-lpm printer, and two 180-lpm printers connected via remote printer attachments. Purchase price is \$254,391, monthly rental on a one-year contract is \$7,220, and monthly rate on a five-year lease is \$5,773.

SOFTWARE AND SUPPORT: The basic OS/3 System Control Software (SCS) is bundled with the System 80 hardware. All of the other System 80 software products are separately priced, and the monthly rental charges for these products are listed in the accompanying price list. In addition, Sperry Univac offers on-site resolution of problems at a fixed monthly "system support fee" of \$105 in lieu of hourly charges.

CONTRACT TERMS: The standard Sperry Univac use and service agreements allow unlimited use of the equipment (exclusive of the time required for remedial and preventive maintenance). There are no extra-use charges. The basic maintenance charge covers maintenance of the equipment for nine consecutive hours a day between the hours of 7 a.m. and 6 p.m., Monday through Friday. Extended periods of maintenance are available at premium rates. The premiums for additional coverage are a percentage of the base maintenance rate and are as follows:

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

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

	<u>Monday through Saturday</u>	<u>Sunday and Holidays</u>
Min. charge per call	\$174	\$198
Each add'l. hour	87	99
Each add'l ¼ hour	22	25

In addition to its standard short-term rental and five-year lease agreements, Sperry Univac offers special five-year and seven-year leases to state and local government users.

EQUIPMENT PRICES

PROCESSORS AND MEMORY

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Monthly Rental*</u>	<u>5-Year Lease*</u>
3045-99	System 80 Model 3 Processor; includes 256K bytes of main storage, basic control storage, disk channel/controller and disk drive, workstation controller and console workstation, diskette controller, and paper peripheral controller**	\$59,261	\$387	\$1,555	\$1,230
3045-95	System 80 Model 5 Processor; includes 256K bytes of main memory, High-Performance Control Storage (HPCOS), disk channel/controller and disk drive, workstation controller and console workstation, diskette controller, and paper peripheral controller**	82,241	439	1,915	1,550
3045-91	System 80 Model 3 Processor; includes 1.5 megabytes of main storage; otherwise the same as 3045-99**	88,366	532	2,345	1,860
3045-87	System 80 Model 5 Processor; includes 1.5 megabytes of main storage; otherwise the same as 3045-95**	111,346	584	2,705	2,180
F2783-05	256K Storage Expansion; expands a 3045-99 or -95 processor from 256K to 512K bytes	5,821	29	158	126
F2783-06	256K Storage Expansion; expands a 3045-99 or -95 processor from 512K to 768K bytes or from 768K to 1024K bytes; maximum two per system; requires F2783-05	5,821	29	158	126
F2783-99	1.25MB Storage Expansion; expands a 3045-99 or -95 processor from 256K bytes to 1.5 megabytes; expansion beyond 1.5 megabytes is via F2783-96	29,105	145	790	630

*Rental prices do not include maintenance.

**Minimum system requires the addition of F2787-98 or -99 Head/Disk Assembly, 8420-00 or 8422-00 Diskette Subsystem, F3619-02 or F3620-02 Console Keyboard, and 0776 or 0789 System Printer; Model 5 also requires either F3425-00 Micrologic Expansion or 1943-99 I/O Microprocessor.

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EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Monthly Rental*</u>	<u>5-Year Lease*</u>
▶ PROCESSORS AND MEMORY (Continued)					
F2783-98	1.0MB Storage Expansion; expands a 3045-99 or -95 processor with F2783-05 installed from 0.5 to 1.5 megabytes; expansion beyond 1.5 megabytes is via F2783-96	23,284	116	632	504
F2783-97	0.75MB Storage Expansion; expands a 3045-99 or -95 processor with F2783-05 and F2783-06 installed from 0.75 to 1.5 megabytes; expansion beyond 1.5 megabytes is via F2783-96	17,463	87	474	378
F2783-15	0.5MB Storage Expansion; expands 3045-99 or -95 processor with F2783-05 and two F2783-06s installed from 1.0 to 1.5 megabytes; expansion beyond 1.5 megabytes is via F2783-96	11,642	58	316	252
F2783-96	0.5MB Storage Expansion; expands any System 80 processor with 1.5 megabytes of storage to 2.0 megabytes	11,642	58	316	252
F2783-95	0.5MB Storage Expansion; expands any System 80 processor with 2.0 megabytes of storage to 2.5 megabytes	11,642	58	316	252
F2783-94	0.5MB Storage Expansion; expands any System 80 processor with F2783-95 installed from 2.5 to a maximum of 4.0 megabytes in 0.5-megabyte increments	11,642	58	316	252
PROCESSOR FEATURES					
F3358-02	Processor Upgrade; upgrades a Model 3 to Model 5; either F3425-00 or 1943-99 is also required	22,980	52	360	320
1943-99	I/O Microprocessor; adds third through eighth communications line capability and fifth through seventh peripheral control capability	7,665	50	196	155
F3425-00	Micrologic Expansion; provides I/O channel functionality in the HPCOS via microcode; mutually exclusive with 1943-99	3,675	21	106	84
F2829-00	Processor Power Expansion; required if any SLCA is added and I/O Microprocessor is not present	735	5	33	26
F3619-02	Console Keyboard, Model A; provides a typewriter-style keyboard for the console workstation; choice of 8 character sets	403	2	12	9
F3620-02	Console Keyboard, Model B; provides a typewriter-style keyboard, 10-key numeric pad, and function pad; choice of 8 character sets	428	3	15	13
F2787-98	Head/Disk Assembly; for use in integrated disk drive only	2,912	19	85	68
F2787-99	Head/Disk Assembly with Fixed Heads; for use in integrated disk drive only	3,883	37	132	110
F2787-97	Head/Disk Assembly with Fixed Heads; provides 0.86 megabyte of fixed-head storage for field-upgrading an F2787-98	4,383	37	145	120
DISK STORAGE					
8417-00	8417 Disk Drive Cabinet; houses up to three F2834-00 Fixed-Media Disk Drives	1,234	5	37	29
F2834-00	Fixed-Media Disk Drive; requires an 8417-00 Cabinet and one F2787-XX HDA per drive	5,525	30	205	164
F2834-99	Fifth Fixed-Media Disk Drive for processors with serial numbers 554 and below; requires 8417-00 Cabinet and one F2787-XX HDA	5,525	30	205	164
F2787-00	Head/Disk Assembly with Fixed Heads; provides 118.2 megabytes of fixed-media storage and 0.86 megabyte of fixed-head storage	3,883	37	132	110
F2787-01	Head/Disk Assembly; provides 118.2 megabytes of fixed-media storage	2,912	19	85	68
F2787-02	Head/Disk Assembly with Fixed Heads; provides 0.86 megabyte of fixed-head storage for field-upgrading an F2787-01	4,383	37	145	120
8419-00	8419 Disk Drive; 72.3-megabyte removable-media disk drive and cabinet; maximum of 7 drives per system	19,340	98	531	429
8419-99	Fifth 8419 Disk Drive for processors with serial number 554 and below	19,340	98	531	429
F3542-00	8419 Removable Disk Pack; for 8419-00 drives; 72.3 megabytes; maintenance contract not available	446	—	27	22
8420-00	Autoload Diskette Subsystem; cabinet and one drive capable of processing up to 20 diskettes; maximum of two unless 8422-00 is installed	4,235	26	114	90
F2833-00	8420 Manual Diskette Expansion; adds one manual diskette drive within the 8420-00 cabinet	1,509	9	43	33
8422-00	Manual Diskette Subsystem; cabinet and one manual diskette drive (up to 1-megabyte capacity)	1,509	9	43	33
F2785-00	8422 Second Drive Expansion; adds a second drive to the 8422-00 cabinet	1,412	9	38	31
F2785-02	8422 Dual Drive; adds a third and fourth diskette drive to the 8422-00 cabinet	2,695	16	72	58
WORKSTATIONS					
3560-79	System 80 Local Workstation, Mod 1; free-standing, microprocessor-based CRT display station; requires F3619-00 or F3620-00 Keyboard; 60 Hz, 120 volts	3,163	13	89	69
3560-78	As above, except 50/60 Hz, 100/120/220/240 volts	3,163	13	89	69
F3619-00	Keyboard, Model A; typewriter-style keyboard; choice of 8 character sets	403	2	12	9
F3620-00	Keyboard, Model B; typewriter-style keyboard, 10-key numeric pad, and function pad; choice of 8 character sets	428	3	15	12
F2919-00	Peripheral Table; for System 80 peripherals such as workstation and card reader	368	—	10	9
F3574-00	Tilt/Rotate Base for System 80 workstation	160	—	9	7
F2791-00	Workstation Control; provides control and interface facilities for configuring up to eight additional workstations; maximum of four	1,897	11	56	44

*Rental prices do not include maintenance.

**Minimum system requires the addition of F2787-98 or -99 Head/Disk Assembly, 8420-00 or 8422-00 Diskette Subsystem, F3619-02 or F3620-02 Console Keyboard, and 0776 or 0789 System Printer, Model 5 also requires either F3425-00 Micrologic Expansion or 1943-99 I/O Microprocessor.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Monthly Rental*	5-Year Lease*
MAGNETIC TAPE					
0871-97	Uniservo 10 9-Track Phase-Encoded Prime Tape Unit and Controller; 40 KB/sec; supports up to 7 additional 0871-83 drives	30,582	174	973	715
0871-93	Uniservo 10 9-Track Phase-Encoded and NRZI Prime Tape Unit and Controller; 40/20 KB/sec; supports up to 7 additional 0871-83 or 0871-81 drives in any combination	32,714	210	1,069	784
0871-89	Uniservo 10 7-Track NRZI Prime Tape Unit and Controller; 20/13.9/5 KB/sec; supports up to 7 additional 0871-83, 0871-81, or 0871-79 drives in any combination	31,816	207	1,057	778
0871-85	Same as 0871-91, except it permits reading of IBM 7-track compatible tape	31,816	207	1,057	778
F3135-00	9-Track NRZI Capability for 0871-99 Controller; required for control of NRZI drives	788	25	60	46
F3133-99	7-Track NRZI Capability for 0871-95 Controller; required for control of 7-track drives	446	5	24	17
F3133-98	7-Track NRZI Native-Mode Capability for 0871-95 Controller	446	5	24	17
0871-83	Uniservo 10 9-Track Phase-Encoded Add-On Tape Unit; 40 KB/sec.	13,668	81	336	243
0871-81	Uniservo 10 9-Track Phase-Encoded and NRZI Add-On Tape Unit; 40/20 KB/sec.	15,012	89	372	266
0871-79	Uniservo 10 7-Track NRZI Add-On Tape Unit; 20/13.9/5 KB/sec.	13,668	81	336	243
PRINTERS					
F2789-00	Paper Peripheral Control; allows connection of two printers (cannot exceed 1500 lpm total) and either two card readers or a card reader and a card punch	1,818	9	50	40
1955-99	Remote Printer Attachment; controls one remotely located 0789-XX or 0798-XX printer up to 5000 feet from the processor complex	3,743	20	108	86
0789-99	Printer; prints 48 characters at 180 lpm; 132 positions; requires F2865-XX Print Band	10,584	87	300	222
0789-96	Printer; prints 48 characters at 300 lpm; 132 positions; requires F2865-XX Print Band	12,500	133	313	232
F2970-00	Upgrades 180-lpm Printer to 300-lpm	1,916	46	12	9
Print Bands for 180-lpm and 300-lpm Printers:					
F2865-01	48-character business/commercial set	184	—	—	—
F2865-06	48-character scientific set	184	—	—	—
F2865-09	48-character set for United Kingdom	184	—	—	—
F2865-10	48-character set for Denmark and Norway	184	—	—	—
F2865-02	48-character set for Finland and Sweden	184	—	—	—
F2865-11	64-character set for Denmark and Norway	184	—	—	—
F2865-03	64-character set for Finland and Sweden	184	—	—	—
F2865-04	64-character modified Fortran set	184	—	—	—
F2865-00	64-character modified ASCII set	184	—	—	—
F2865-05	96-character ASCII set	184	—	—	—
F2865-07	128-character universal OCR-B (ISO) set	184	—	—	—
F2865-13	128-character universal OCR H-14 set	184	—	—	—
F2865-18	192-character Cobol-Fortran-business set	184	—	—	—
F2865-12	96-character set for Finland and Sweden	184	—	—	—
F2865-08	128-character universal OCR-B (ECMA-11) set	184	—	—	—
F2865-17	128-character universal Univac 77L set	184	—	—	—
F2865-15	128-character universal OCR-A set	184	—	—	—
0789-93	Printer; prints 48 characters at 640 lpm; 132 positions; requires F3321-XX Print Band	15,650	156	397	298
F3321-XX	Print Band; for 640-lpm printer; available in all the same versions as the F2865-XX Print Band, above	184	—	—	—
0776-99	Printer; prints 48 characters at 1200 lpm; 136 positions; requires F2346-XX Print Cartridge	47,421	325	1,410	1,077
F2346-XX	Print Cartridge; for 1200-lpm printer; available in all the same versions as the F2865-XX Print Band, above	1,440	—	35	26
0797-99	Matrix Printer; 80 cps; 80 positions; choice of 8 character sets; 50/60 Hz, 100/120 volts	1,900	27	84	63
0797-98	As above, except 50 Hz, 200/240 volts	1,900	27	84	63
0798-68	Matrix Printer; 200 cps, bidirectional; 132 positions; requires 0789 or 0776 printer; 60 Hz, 100/120 volts	6,650	64	188	156
0798-66	As above, except 50 Hz, 200/240 volts	6,650	64	188	156
0798-99	Matrix Printer; 200 cps, bidirectional; 132 positions; choice of 10 character sets; used for off-line screen dumps under workstation control; 60 Hz, 100/120 volts	6,650	64	188	156
0798-97	As above, except 50 Hz, 200/240 volts	6,650	64	188	156
F3582-00	Operator Selection of 6 or 8 lines per inch; mutually exclusive with F3583-00	152	1	4	3
F3583-00	9-Wire Printhead; requires 96-character ASCII character set	300	2	16	9
F2648-00	Document Parting Bar	114	1	3	2
F3587-00	Compressed Print; 14 characters per inch	185	1	6	5
CARD EQUIPMENT					
0719-04	Card Reader; 80-column, 300 cpm	6,363	43	171	122
0608-03	Card Punch; 80-column, 75-160 cpm	14,020	93	378	269
F2830-00	Reader Feature for 0608-03	648	5	15	13

*Rental prices do not include maintenance.

**Minimum system requires the addition of F2787-98 or -99 Head/Disk Assembly, 8420-00 or 8422-00 Diskette Subsystem, F3619-02 or F3620-02 Console Keyboard, and 0776 or 0789 System Printer; Model 5 also requires either F3425-00 Micrologic Expansion or 1943-99 I/O Microprocessor.

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EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Monthly Rental*</u>	<u>5- Le</u>
► COMMUNICATIONS					
F2799-XX	Single-Line Communications Adapter, Low-Speed Asynchronous; supports TTY and DCT 500 protocols; ASCII code, half duplex at up to 9600 bps; provides auto answer; choice of RS-232C/X.21.BIS or MIL-188A interface	1,885	11	52	
F2788-XX	Single-Line Communications Adapter, Medium-Speed Synchronous; supports Uniservo 100/200 and UTS 400 protocols; half duplex to 9600 bps, full duplex to 4800 bps; requires external clock; provides auto answer; choice of RS-232C/X.21.BIS or MIL-188A interface	1,743	9	48	
F2798-XX	Single-Line Communications Adapter, Medium-Speed Synchronous (UDLC); supports UDLC protocol; half duplex to 19,200 bps, full duplex to 9600 bps; requires external clock; provides auto answer; RS-232C/X.21.BIS interface	1,885	11	52	
F3471-00	SLCA Power Cable; required if two SLCA's are used and 1943-99 I/O Microprocessor is not used	53	—	9	
F3472-00	SLCA Baffle; required if one SLCA is used and 1943-99 I/O Microprocessor is not used	53	—	9	
F3794-00	Auto-Dialer; provides adapter for up to three automatic dialing interfaces meeting RS-366 for V-series or circuit-switched public data networks	2,818	14	70	

*Rental prices do not include maintenance.
 **Minimum system requires the addition of F2787-98 or -99 Head/Disk Assembly, 8420-00 or 8422-00 Diskette Subsystem, F3619-02 or F3620-02 Console Keyboard, and 0776 or 0789 System Printer; Model 5 also requires either F3425-00 Micrologic Expansion or 1943-99 I/O Microprocessor.

SOFTWARE PRICES

		<u>Monthly Rental</u>
SYSTEMS SOFTWARE		
6211-99	Extended System Software; consists of Screen Format Generator, Dialog Specification Language Translator, Data Utility, SORT/MERGE, SORT3, and Spooling and Job Accounting	\$169
6212-00	SORT/MERGE	61
6213-00	SORT3	61
6219-99	RPG II	61
6222-00	Cobol-1974	85
6223-00	Fortran IV	97
6224-00	Basic	85
6225-00	Escort	48
6233-00	Assembler	182
6226-00	Editor	48
6217-00	Information Management System, Single Thread; requires 6211-99	133
6232-00	Information Management System, Multi-Thread; requires 6211-99	150
6218-00	Data Management System; requires 6211-99 and 6222-00	212
6231-00	ICAM Terminal Support Facility	109
6230-00	NTR (Nine Thousand Remote) System Utility; requires 6231-00	30
6229-01	Distributed Data Processing Transfer Facility; requires 6211-99, 6231-00, and either 6255-00 or 6248-XX	97
6229-02	Distributed Data Processing File Access; requires 6231-00, and either 6255-00 or 6248-XX	150
6229-03	Distributed Data Processing IMS Transaction Processor; requires 6232-00, 6231-00, and either 6255-00 or 6248-XX	150
6247-01	IBM 3270 Emulator; requires 6211-99 and 6231-00	20
6247-02	Remote Terminal Processor; requires 6231-00 and 6211-99	75
6248-00	Datex-L (Germany) Public Data Network Facility; requires 6231-00	250
6248-01	Datex-P (Germany) Public Data Network Facility; requires 6231-00	250
6248-02	Transpac (France) Public Data Network Facility; requires 6231-00	250
6248-03	Datapac (Canada) Public Data Network Facility; requires 6231-00	140
6248-04	DDX-C (Japan) Public Data Network Facility; requires 6231-00	250
6248-05	DDX-P (Japan) Public Data Network Facility; requires 6231-00	250
6255-00	DCA Termination Systems; requires 6231-00 and 6211-99	65
6130-03	UTS 400 Cobol	37
6201-03	UTS 400 Edit Processor; requires 6228-00 and 6231-00	38
6228-00	UTS 400 Load/Dump Facility	37
6184-04	UTS 4000 Loadable Character Set Generator	20
APPLICATIONS SOFTWARE		
6563-01	UNIS 80; ready-to-use version	500
6563-00	UNIS 80-E; extended, source-code version	950
6563-02	UNIS 80E; engineering source-code version	400
6563-99	UNIS 80E; engineering, inventory posting, and order entry source-code version	800
6557-00	ACS 80 Accounts Receivable	63
6557-01	ACS 80 Accounts Payable	63
6557-02	ACS 80 General Ledger	63
6557-03	ACS 80 Payroll	75

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SOFTWARE PRICES

		<u>Monthly Rental</u>
▶ APPLICATIONS SOFTWARE (Continued)		
6558-00	ICS 80 (Information Collection System)	144
6564-01	Order Entry 80; ready-to-use version	362
6564-00	Order Entry 80-E; source-code version	483
6562-00	UNIDIS—Wholesale; Order Entry and Stock Control	420
6562-01	UNIDIS—Wholesale; Inventory Management	420
6562-99	UNIDIS—Wholesale; Order Entry, Stock Control, and Inventory Management	840
6572-00	Apparel Information System	1,500 ■