

IBM 8100 Information System

MANAGEMENT SUMMARY

IBM's 8100 Information System recently received a much-needed shot in the arm with the July introduction of three new top-end processors, operating system enhancements, and improved distributed processing software. The three new processors, the 8140 C72, C82, and C92, increase the 8100's maximum main memory capacity to 2,048K bytes, double its previous limit. Expanded communications capabilities include compatibility with the CCITT X.21 standard for accessing public data networks. System software has been improved for better overall system administration and distributed processing network management. The new models and associated software are scheduled for 2nd quarter 1982 availability.

The 8100 uses two operating systems. One, the Distributed Processing Programming Executive (DPPX), provides substantial stand-alone processing capabilities for an 8100 system, including COBOL, FORTRAN, and PL/I compilers and support for a wide range of terminals. The other, the Distributed Processing Control Executive (DPCX), makes the 8100 operate like an IBM 3790 Communications System; with applications developed at the host site.

The 8100 processor is a minicomputer with a 16-bit memory bandwidth, 48 sets of eight 32-bit registers, and 32-bit logical addressing (4-megabyte range). Thirty-three processor models are now available within two model numbers: 8130 and 8140. The 8130 operates with a cycle time of 1500 nanoseconds, and the 8140 has a cycle time of 800 nanoseconds. Arithmetic and logical operations can be performed on 8-, 16-, or 32-bit operands. Memory capacity ranges from 256K to 2,048K bytes. The newer 8140C models can have one or two processors, depending on user requirements.

Each processor contains fixed-disk storage, a diskette drive, a limited number of ports for connecting terminals, ➤

IBM's 8100 can operate as either a stand-alone or distributed processing system. New enhancements and models provide the user with integrated word processing and data processing capabilities, memory sizes up to 2,048K bytes, and increased support for public data networks.

MODELS: 8130A (4 models); 8140A (20 models); 8140B (6 models); and 8140C (3 models).

CONFIGURATION: The 8100 can have from 256K to 2,048K bytes of memory, 23MB to 123MB of disk storage per CPU, and up to 11 communication ports.

COMPETITION: As a stand-alone: Burroughs B-1900, DEC VAX-11/750, Honeywell DPS 6, NCR I-9000, and Univac V77-800; as a DDP system: Four-Phase Series IV, Harris 1600 Series, Datapoint 6600/8800, and Northern Telecom 400 Series DDP systems.

PRICE: Base purchase prices range from \$27,780 to \$124,540.

CHARACTERISTICS

MANUFACTURER: IBM Corporation, Data Processing Division, 1133 Westchester Avenue, White Plains, New York 10604. Telephone (914) 696-1900.

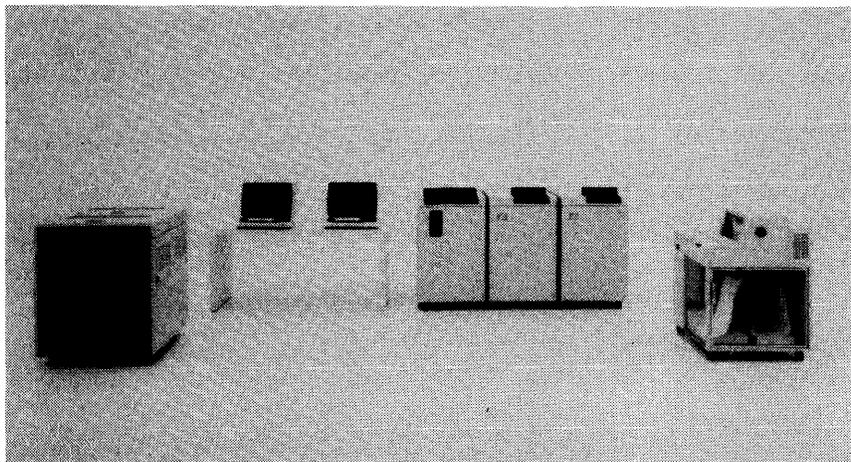
MODELS: 8130 Processor, with 4 submodels; 8140 Processor, with 29 submodels.

DATE ANNOUNCED: October 3, 1978.

DATE OF FIRST DELIVERY: August 1979.

DATA FORMATS

BASIC UNIT: 8-bit byte, 32-bit word. Bytes may be handled separately or grouped into fields. Each byte can represent one alphanumeric character, one BCD digit, or eight binary bits. ➤



This IBM 8100 configuration includes, from left to right: two 8809 Magnetic Tape Units, two 8775 Display Terminals; an 8100 Processor, two 8101 Storage and I/O units, and a 3289 Line Printer, Model 3. An 8100 system can support up to 2,048K bytes of memory and 639 megabytes of disk storage.

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➤ and provisions for expanding the disk storage and port capacities through one or more 8101 Storage and I/O Units.

The capabilities of the various processor models can be most easily understood by regarding them as ten groups of two to four models each: 8130 A2X, 8140 A3X, 8140 A4X, 8140 A5X, 8140 A6X, 8140 A7X, 8140 B5X, 8140 B6X, 8140 B7X, and 8140 C72, C82, and C92. Within each of these groups (except the 8140 B and C models), two models provide 29 or 64 megabytes of fixed-disk storage. The other two models within each group trade 6 megabytes of fixed-disk storage for 131K bytes of fixed-head storage. The 8140 B models provide 58 or 123 megabytes of fixed-disk storage. The 8140 C models provide 123 megabytes of fixed-disk storage, and all offer 131K bytes of fixed-head storage.

The Distributed Processing Program Executive (DPPX) used with the 8100 provides a Data Base and Transaction Management System with data structures similar to those of CICS/VS. A 3270 Data-Stream Compatibility feature permits existing 3270 terminals to be connected to the host through an 8100 system. The Host Command Facility, running in the host System/370, permits host-site personnel the same kind of access to the 8100 that an operator would have at the 8100 console. Programs can be written in COBOL, FORTRAN, PL/1, or assembly language. An English-language COBOL pre-compiler is also available. The Distributed Presentation Services facility permits interactive screen formatting. Also provided is an RJE capability. DPPX supports SDLC, BSC, and asynchronous protocols; supported terminals include the 3270 (SDLC or BSC), as well as the newer 8775 display terminal and the 3289 and 3287 printers. Also supported are the 3630 plant communications devices, card I/O (via the 3289 Model 3 printer), and up to four 8809 magnetic tape drives. The Distributed Office Support Facility (DOSF) is designed to integrate word processing and data processing activities. Along with enhancements to their major host operating systems, IBM in July unveiled the DPPX/Problem Determination Application and DPPX/Programmed Operator Facility program products. Working in conjunction with the Network Problem Determination Application Version 2 and Host Command Facility Version 2, the new packages provide improved problem detection and notification to the network operator.

The Distributed Processing Control Executive (DPCX) supports a more limited array of device types. All program development is performed on the host computer. In effect, DPCX provides for emulation and expansion of IBM 3790 systems; existing 3790 programs will run under DPCX. The DPCX software supports up to 31 concurrent application programs without size constraints via virtual memory management. RJE and message switching are also supported.

The 8100 is supported at the host System/370 site under OS/VS1, OS/VS2 MVS, DOS/VS, and DOS/VSE. ➤

➤ **FIXED-POINT OPERANDS:** Can be a byte, a halfword, or a word in length. Variable-length operands of up to 256 bytes of halfwords may be located anywhere in main storage.

FLOATING-POINT OPERANDS: Some 8140 Processor models offer hardware facilities for floating-point arithmetic. Floating-point operands are one word or one double-word in length and may be located in a floating-point register or in main storage.

INSTRUCTIONS: An instruction is either 16 bits (halfword) or 32 bits (word) long. Each instruction is in one of seven basic formats. The halfword instruction formats are: register-register (RR), register-immediate (RI), register-storage (RS), and floating-point register-register (FR). The word instruction formats are: register-register long (RR-Long), register-storage long (RS-Long), and floating-point register-storage (FS). The format names express, in general terms, the specification of the associated operands.

INTERNAL CODE: EBCDIC (Extended Binary-Coded Decimal Interchange Code).

MAIN STORAGE

TYPE: MOSFET (metal oxide semiconductor field-effect transistor).

CYCLE TIME: 8130 processor, 1500 nanoseconds per 16-bit fetch; 8140 processor, 800 nanoseconds per 16-bit fetch.

CAPACITY: 262,144, 327,680, 393,216, 524,288, 768,432, 1,048,576, 1,572,864, or 2,097,152 bytes.

CHECKING: A parity bit with each byte is generated during writing and checked during reading. Error Correction Code (ECC) is provided on 8140 C models for single-bit error correction and double-bit error detection.

STORAGE PROTECTION: The dynamic address relocation mechanism provides storage protection in the form of logical address space isolation. The mechanism ensures that the limits of each logical address space are not exceeded by storage access requests from the program or channel I/O operation with which the logical address space is associated.

CENTRAL PROCESSORS

All 8100 models, with the exception of the 8140 C, use a single, interrupt-driven central processor. The 8140 C models use one or two CPUs, which are similar to 8130 and 8140 A and B models. One CPU handles channel logic and system control functions and the other does not. With both processors operating in what IBM calls "dual mode," a 60 percent performance improvement is possible, according to IBM. The 8140 C can also operate with a single CPU, although no performance gains are stated.

REGISTERS: There are 48 sets of high-speed general registers that are separate from storage. A register set consists of eight registers. Each set may be used as eight 32-bit registers, eight 16-bit registers, or sixteen 8-bit registers. Each program is assigned two sets of general registers, the primary register set and the secondary register set. These registers can be used for addressing, indexing, and temporary operand storage.

Operands in general registers may be a byte, a halfword, or a word in length. One general register may hold multiple operands, each of which may be processed independently.

Eight sets of floating-point registers are provided for floating-point operations. A floating-point register is 64 bits in length, with 4 floating-point registers in each set. One set of floating-point registers can be assigned to a program. Floating-point ➤

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➤ A central feature of the 8100 system is the extensive use of display and printer terminals. While the 3790 was IBM's pioneering effort in "transaction processing," it has never been widely accepted; the chief complaints about the 3790 were cost and difficulty of programming. Under DPCX, the 8100 looks like a bigger, faster, less costly 3790, with essentially the same programming. Under DPPX, however, the 8100 looks more like one of IBM's small System/370 computers, except that it is transaction-oriented rather than batch-oriented.

The 8100 features flexibility of terminal connection. Each port can support a communications link (SDLC, BSC, or asynchronous), a loop, or directly connected devices with an RS-232-C interface (up to 40 feet) or a V.35 interface (up to 1000 feet). Under DPCX, supported devices are limited to SDLC 3276 display and printer clusters, 8775 display terminals, or 3289 printers. Under DPPX, limited support is provided for IBM 2780/3780 BSC devices and for IBM 2741 and Teletype 33/35 terminals. The CCITT X.21 interface is supported under DPPX, and permits access into public data networks. In addition to the ports, up to 24 3277/3288/3289 display and 3284/6/7/8/9 printer units can be connected to an 8100 system through one or more 8101 Storage and I/O units. There are no published system limits on the number of devices controllable by one 8100 system, but the number must be impressive. Careful analysis will be required to see whether the more ambitious complements will satisfy terminal response-time criteria.

The configurational possibilities, the announced software support, and IBM's own comments point to three distinct application areas for the 8100:

- Host-controlled distributed system.
- Stand-alone transaction-oriented system with local and/or remote terminals.
- Autonomous transaction system with "loose" connection to one or more host systems.

For some time IBM has embraced the concept of distributed processing. With the continued enhancement of the 3790 and the SNA/ACF software, along with the enhanced 3270 family of display terminals, it was clear that IBM needed a programmable controller to permit increased network flexibility. The 8100 is that controller. But IBM was not the first to introduce such a unit. Minicomputer and distributed terminal vendors have been announcing—and delivering—such units for several years. Since the 8100 (under DPPX) is only loosely connected to the host computer, it faces stiff competition.

USER REACTION

Datapro received 17 responses from IBM 8100 users in our 1981 User Ratings of Computer Systems. A total of ➤

➤ operands may be either short format (32 bits) or long format (64 bits). When floating-point operands are 32 bits in length, the rightmost 32 bits in a floating-point register are unused.

ADDRESSING: Storage addresses are linear from address 0 to the maximum byte address of the installed storage. The processor accesses main storage using real addresses. A real address is considered to be the byte address of a physical main storage location. A real address is associated with only one main storage location.

An address used by a program or during a channel I/O operation is a logical address. Logical addresses are not used to access main storage directly; a logical address identifies a byte location within a logical address space. Storage addressing is not permitted to wrap around from the maximum address to address zero. Programs and channel I/O operations are assigned a logical address space by the supervisor program according to their size. The processor automatically relocates the logical addresses issued by a program, or during a channel I/O operation, into the processor address space. Logical addresses are relocated by the dynamic address relocation mechanism. The relocated address may be used to access main storage, or it may require translation by the dynamic address translation mechanism before main storage can be accessed by the processor.

INSTRUCTION REPERTOIRE: All models have 112 instructions. The following descriptions are grouped by the types of operations performed by the processor when the instructions are executed.

- **Arithmetic operations**—instructions are provided for addition, subtraction, multiplication, division, and comparison of fixed-point binary numbers. Positive numbers are represented in true binary notation. Negative numbers are represented in two's-complement notation. Byte and halfword formats are provided for fixed-point numbers. Addition, subtraction, and comparison can also be performed on numbers that are represented by variable-length strings of bytes or halfwords.
- **Logical operations**—instructions are provided for AND, OR, and exclusive OR operations on byte and halfword operands.
- **Shift and rotate operations**—instructions are provided to shift (left) or rotate (left) the bits within a byte or halfword operand.
- **Variable-length field operations**—move and logical comparison instructions are provided that operate on variable-length fields in main storage.
- **Load and store operations**—instructions are provided for the transfer of data between main storage and general registers.
- **Load register operations**—register-to-register format instructions are provided to transfer a byte or halfword from one general register location to another.
- **Branching operations**—the normal sequential execution of instructions can be changed by the use of branching operations to perform subroutine linkage and decision making.
- **Input/output instructions**—instructions are provided to transfer data between the processor and I/O devices, as described below under "input/output control."

In addition to the above, there are 30 floating-point instructions standard in the 8140 Models A41, A42, A43, and A44. The floating-point instruction set is an option in all 8140 B and C processors. ➤

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8130/8140 PROCESSOR COMPONENTS

Processor Model	Main Storage*	Disk Storage	Communications Ports	Hardware Floating-Point	Expanded Function Panel
8130-A21	256KB, 384KB, 512KB, 768KB, or 1024KB	29MB	2 to 6	No	No
8130-A22	256KB, 384KB, 512KB, 768KB, or 1024KB	23MB**	2 to 6	No	No
8130-A23	256KB, 384KB, 512KB, 768KB, or 1024KB	64MB	2 to 6	No	No
8130-A24	256KB, 384KB, 512KB, 768KB, or 1024KB	58MB**	2 to 6	No	No
8140-A31	256KB, 384KB	29MB	3	No	Yes
8140-A32	256KB, 384KB	23MB**	3	No	Yes
8140-A33	256KB, 384KB	64MB	3	No	Yes
8140-A34	256KB, 384KB	58MB**	3	No	Yes
8140-A41	320KB	29MB	2***	Yes	Yes***
8140-A42	320KB	23MB**	2***	Yes	Yes***
8140-A43	320KB	64MB	2***	Yes	Yes***
8140-A44	320KB	58MB**	2***	Yes	Yes***
8140-A51	512KB	29MB	No	No	No
8140-A52	512KB	23MB**	No	No	No
8140-A53	512KB	64MB	No	No	No
8140-A54	512KB	58MB**	No	No	No
8140-A61	768KB	29MB	No	No	No
8140-A62	768KB	23MB**	No	No	No
8140-A63	768KB	64MB	No	No	No
8140-A64	768KB	58MB**	No	No	No
8140-A71	1024KB	29MB	No	No	No
8140-A72	1024KB	23MB**	No	No	No
8140-A73	1024KB	64MB	No	No	No
8140-A74	1024KB	58MB**	No	No	No
8140-B51	512KB	58MB**	3 to 11	Optional	Yes
8140-B52	512KB	123MB**	3 to 11	Optional	Yes
8140-B61	768KB	58MB**	3 to 11	Optional	Yes
8140-B62	768KB	123MB**	3 to 11	Optional	Yes
8140-B71	1024KB	58MB**	3 to 11	Optional	Yes
8140-B72	1024KB	123MB**	3 to 11	Optional	Yes
8140-C72	1024KB	123MB**	Up to 10	Optional	Yes
8140-C82	1536KB	123MB**	Up to 10	Optional	Yes
8140-C92	2048KB	123MB**	Up to 10	Optional	Yes

*The base main storage in the 8140 models contains 4K bytes of non-programmable read-only storage.

**Plus 131K bytes of fixed-head disk storage.

***These features are mutually exclusive on the 8140-A41, A42, A43, and A44.

➤ 29 systems, with an average installed life of about 8 months, was reported. Only one user purchased his systems, while all others rented or leased from IBM. The most frequently listed applications were manufacturing, order processing, payroll/personnel, and accounting. As might be expected, 14 of 17 users had their systems operating at a distributed processing site. All were using local terminals, slightly more than half were running a data base management system, and most all had some definite plans for getting more from their 8100s during 1981. They were generally pleased with most aspects of their systems, but expressed dissatisfaction with IBM's delivery dates, inadequate processing power of the 8100, ➤

➤ **INTERRUPTS:** Eight priority interrupt levels are provided for I/O and program interrupt processing. Switching control between levels is done entirely by hardware.

Individual system requirements may specify that an I/O device be associated with more than one program. System design flexibility is enhanced by the ability to assign an I/O device to a different priority level for each program with which it is associated. In the 8100, I/O devices are assigned to a specific priority level through programming. A Programmed I/O (PIO) command permits the supervisor program to define the priority level with which a device is to be associated. When the device is to be associated with a different program that executes on another priority level, the device can be assigned to that priority level by the supervisor program. ➤

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▷ and insufficient system support. The majority of users felt, however, that the 8100 performed as expected, and would recommend it to others. The table below summarizes the users' ratings of the 8100 system:

	Excellent	Good	Fair	Poor	WA*
Ease of operation	3	10	2	2	2.82
Reliability of mainframe	5	7	3	2	2.88
Reliability of peripherals	4	10	2	1	3.00
Maintenance service:					
Responsiveness	5	8	3	0	3.13
Effectiveness	2	9	5	0	2.81
Technical support:					
Trouble-shooting	1	8	5	2	2.50
Education	0	10	5	1	2.56
Documentation	1	8	5	2	2.50
Operating system	2	11	3	0	2.94
Compilers & assemblers	3	7	3	2	2.73
Applications programs	0	7	4	2	2.38
Ease of programming	5	4	5	2	2.75
Ease of conversion	4	4	4	3	2.60
Overall satisfaction	2	10	3	1	2.81

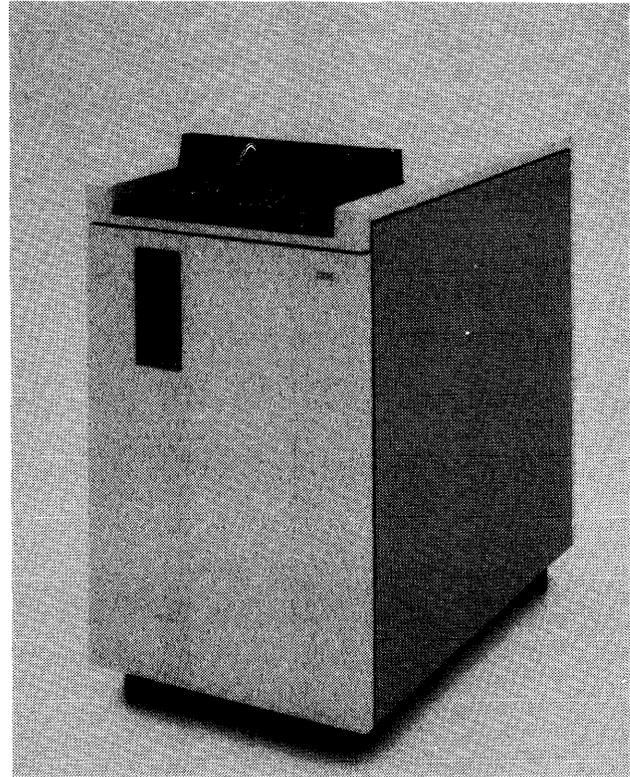
*Weighted Average on a scale of 4.0 for Excellent.

Datapro telephoned three 8100 users for additional comments. We first called on the engineering department of a northeastern manufacturing firm that uses their 8140 for application development. They investigated several other vendors, but went with the 8100 largely because they are an IBM shop. Although the 8100 now is "stable," their first year was plagued with software and hardware problems. IBM finally cleared up most of their problems, many of which resulted from insufficient knowledge of the 8100 on both sides. Their original configuration was underpowered, and since that time they have doubled memory to one megabyte, and are planning to go to two megabytes when the new 8140 C models are available.

A midwestern governmental agency uses an 8140 B primarily for file retrieval. It uses DPCX and communicates with the host 3033. Their original plan was to install this application on a DECSYSTEM-20, however, the DECSYSTEM didn't have enough room for it. Although their primary difficulties came from learning how to program the 8100, IBM provided the support they needed, and today the system continues to function smoothly.

Our last call was to an insurance company in the northeast that uses the 8100 extensively in its branch offices to handle various insurance transactions. They originally considered using the 3790, but needed the extra performance of the 8100. DPPX is used at all locations for local activities, and they do RJE in the evening for certain transactions. Their uptime has been very good, and the software is "finally settling down." Response times have varied quite a bit to date, but some new software updates are expected to correct this. The company's agents have also been very pleased with the improved service. □

► Specifically, the assignment of an I/O device to a priority level determines the priority level on which I/O interrupts are reported by that device. Multiple devices can be assigned to a single priority level.



The 8140 processor is shown with the Expanded Function Operator Panel (EFOP). Supplied in addition to the basic panel as a program diagnostic aid, the EFOP provides programmer and operator access to storage, program stop and restart capability, and current operating indicators.

INPUT/OUTPUT CONTROL

I/O operations provide for the transfer of information between an I/O device and a general register or main storage. PIO operations transfer a fixed amount of data to or from a general register; channel I/O (CHIO) operations transfer variable-length blocks of data to or from main storage.

PIO operations and CHIO operations share the I/O interface. The interface consists of an 18-bit data bus, including parity, and control lines to synchronize the transfer of information across the I/O interface. The processor includes the channel logic that controls the flow of information across the I/O interface. When the channel is not controlling an I/O operation, it monitors the attached devices for CHIO data transfer requests and I/O interrupt requests.

CONFIGURATION RULES

One nonremovable high-performance disk and one diskette are standard on all 8130 and 8140 models. All 8130 models can attach up to 6 communication links or local loops, while the 8140 can attach up to 11, depending on the model. Some 8140 models offer floating-point arithmetic hardware. Floating-point arithmetic can be performed on the 8130 processor and on 8140 models without floating-point hardware via the DPPX/FORTRAN floating-point subroutines.

The 8130 base system can be expanded to include up to two 8101 Storage and Input/Output units, while the 8140 base system can be expanded to include up to four 8101s. The 8101 allows expansion of the system's communication and I/O capabilities, as well as additions to disk storage. The 8101 is ►

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► available in six models; Model A10 and A20 have no disk storage, Model A11 has 29 million bytes of disk storage, Models A13 and A23 have 64 million bytes, and Model A25 has 129 million bytes. All devices attachable to the 8130 and 8140 are attachable to the 8101. In addition, directly attached 3277 display terminals and related printers are attachable only via the 8101. The 8101 is attached to the I/O bus of the 8130 or 8140 processor.

One of the 8101s attached to an 8130 or 8140 B Model processor can be configured with communication or display features, type I or type II. Two of the 8101s attached to an 8140 A Model processor can be configured with these features. If an 8809 Model 1B magnetic tape unit is attached to the 8130 processor, only one 8101 may be attached.

If an 8809 Model 1B is attached to an 8140 processor, any three 8101s may be attached.

The 8101 with a device attachment feature can accommodate the attachment of up to four of the following IBM I/O devices in any combination:

- 3277 Display Station, Models 1 and 2
- 3284 Printer, Models 1 and 2
- 3286 Printer, Models 1 and 2
- 3287 Printer, Models 1 and 2
- 3288 Printer, Model 2

Each Display and Printer Additional feature (1506) allows the attachment of up to four more of these I/O devices in any combination; however, there are limits to the attachment of some device types. A maximum of six device attachment features can be selected for one 8101 unit, allowing a maximum total of 24 of these I/O devices. Each I/O device is connected to the 8101 by a single coaxial cable with a maximum length of 2000 feet.

An Expanded Function Operator Panel (EFOP) feature is available with some models of the 8140 processor. The EFOP is provided in addition to the basic panel as a program diagnostic aid. It provides all of the functions of the basic panel plus read/write capability and additional function keys and indicators. Communication capabilities are not allowed on floating-point processors when the EFOP feature is selected.

Refer to the 8130/8140 Components table for the various 8130 and 8140 models and their components.

MASS STORAGE

All models of the 8130 and 8140 processors and four models of the 8101 Storage and I/O unit contain nonremovable high-speed direct-access storage and removable diskette storage.

The 8101 Model All contains 29,327,360 bytes of storage under movable heads. The 8101 Model A13 and A23 contain 64,520,192 bytes under movable heads. The 8101 Model A25 contains 129,040,384 bytes of disk storage.

Direct access storage on the 8130 ranges from 23,461,888 bytes to 64,520,192 bytes, depending on the model. The storage is configured either with movable heads (Models A21 and A23) or a combination of movable and fixed heads (Models A22 and A24). Fixed head storage on all 8100 models has 131,072 bytes. Storage capacities on 8140 A models are similar to the 8130, although there are five times as many 8140 A models as 8130s. A choice of moving head storage (Models A31, A33, A41, A43, A51, A53, A61, A63, A71, and A73) or moving/fixed head storage (Models A32,

A34, A42, A44, A52, A54, A62, A64, A72, and A74) is available. The 8140 B models have both movable and fixed head storage in two capacities: 58,654,720 bytes (Models B51, B61, and B71) and 123,174,192 bytes (Models B52, B62, and B72). All three 8140 C models have 123,174,192 bytes of fixed/movable disk storage.

For all units, the average access time is 27 milliseconds, the average rotational delay is 9.6 milliseconds, and the data transfer rate is 1.031 million bytes per second.

Removable diskette storage is available with a capacity of up to 985,088 bytes and a data transfer rate of up to 62K bytes per second. The diskette drive can read and write in basic data exchange format on either the IBM diskette type 2D or the IBM diskette type 1.

INPUT/OUTPUT UNITS

The 8100 supports a wide variety of input/output devices, a list of which follows. For additional details on these peripherals, please refer to Reports 70C-491-04 and 70C-491-06.

8809 MAGNETIC TAPE UNIT: A 9-track, 1600 bpi phase-encoded (PE) tape system with two speeds: 12.5 ips/20,000 bps or 100 ips/160,000 bps.

3501 CARD READER: Reads 80-column cards at 50 cpm.

2502 CARD READER: Reads 80-column cards at 150 cpm.

3521 CARD PUNCH: Punches 80-column cards at up to 50 cpm.

3262 BAND PRINTER: Prints at either 325 or 650 lpm with a 48-character set, depending on model. Optional 64-, 96-, and 128-character sets are available. A 288-character buffer is standard in all models.

3284 MATRIX PRINTER: Prints at 40 cps; has either 480- or 1920-character buffer.

3286 MATRIX PRINTER: Prints at 66 cps; has either 480- or 1920-character buffer.

3287 PRINTER: Bidirectional printer that prints at 80 or 120 cps; Models 1C and 2C print in color.

3288 LINE PRINTER: Prints at 120 lpm with 48-character set; includes 1920-character buffer.

3289 LINE PRINTER: Prints at either 155 or 400 lpm using a 48-character set.

3642 ENCODER PRINTER: Drum printing unit using a 48-character set; available either with manual or automatic document feed.

3645 MATRIX PRINTER: A bidirectional 120-cps printer with 132 print positions; uses a 94-character set.

TERMINALS

A wide variety of terminals can be connected to the 8100 and 8101 systems, a list of which follows:

3274 CONTROL UNIT: Controls up to 12 327X display terminals and various printers.

3276 CONTROL UNIT DISPLAY STATION: Controls various configurations of 327X display terminals and printers; 40 or 80 cpl; 960-, 1920-, 2560-, and 3440-character displays; speeds up to 9600 bps. ►

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► **327X DISPLAY TERMINALS:** Includes 3277, 40 or 80 cpl, 480- or 1920-character display; 3278, 40 or 80 cpl, 960- or 1920-character display; and 3279, 80 cpl, 4- or 7-color capability, 1920- or 2560-character display.

3641 REPORTING TERMINAL: Includes 35- or 70-position keyboard, 22-position display, uses 5 x 7 dot matrix; speeds up to 9600 bps.

3643 KEYBOARD/DISPLAY: Uses gas panel display; 40 cpl; 240-, 480-, or 1024-character display; 5 x 7 or 7 x 9 dot matrix; speeds up to 9600 bps.

3767 COMMUNICATION TERMINAL: Desk-top unit; prints 40, 80, or 120 cps with bidirectional printer mechanism; 512-byte buffer available.

8775 DISPLAY TERMINAL: Displays 960, 1920, or 2560 characters in 9 x 16 matrix; also displays 3440 characters in 9 x 12 matrix, depending on model; speeds up to 9600 bps via a loop or SNA/SDLC attachment.

COMMUNICATIONS CONTROL

Each communications adapter in an 8100 system controls one loop or data link (i.e., through a common carrier communication line) or one "direct connection" to an I/O unit that is a limited distance from the 8100 system. Synchronous data link control (SDLC), binary synchronous communications (BSC), or start-stop (S/S) communications protocols are supported.

The *SDLC communications adapter* can connect to analog networks, digital networks, or direct connections. Analog network speeds range from 600 to 9600 bps, digital network speeds range from 2400 to 9600 bps, and direct connection speeds range from 600 to 9600 bps. The maximum distance for direct connection through an RS-232 interface is 40 feet. The maximum distance for direct connection through a V.35 interface is 1000 feet.

The 8100 system can use the SDLC communications adapter to communicate with:

- An IBM System/370 host through a 3704/3705 or Integrated Communications Adapter with line speeds up to 56,000 bits per second.
- Other IBM 8100 systems.
- An IBM 3262 Line Printer, Models 2, 3, 12, 13.
- An IBM 3274 Control Unit, Model 51C.
- An IBM 3276 Control Unit/Display Station, Models 11, 12, 13, 14.
- An IBM 3631 or 3632 Plant Communications Controller.
- An IBM 3767 Communications Terminal, Models 1, 2, 3.
- An IBM 3842/3843 Loop Control Unit

CCITT X.21 support can be provided on all 8100 models for accessing switched or non-switched data transmission lines available on public data networks. More flexible configurations are possible, according to IBM, with X.21 support. The feature also provides auto-answer and auto-call capabilities. Speeds up to 48,000 bps can be supported.

The *BSC communications adapter* can connect to analog networks, digital networks, or direct connections. Analog network speeds range from 600 to 9600 bps, digital network speeds range from 2400 to 9600 bps, and direct connection speeds range from 600 to 9600 bps.

The *S/S communications adapter* can connect to analog networks or direct connections. Analog network speeds and direct connection speeds range from 110 to 300 bps for the 8130 and from 110 to 1200 bps for the 8140. S/S direct connections are through an RS-232 interface; the maximum distance is 40 feet. The 8100 can use the S/S communications adapter to communicate with the IBM 2741 Communication Terminal, IBM 3101 Display Terminal, and devices such as the Teletype 33/35.

An *8100 loop* consists of cabling and accessories that allow multiple I/O units to be connected to a common cabling system that can include both indoor and outdoor cables. The accessories include various types of connection boxes for connecting I/O units to the loop.

The loop can be directly attached or data-link-attached to an 8100 system (8130 or 8140 processor, or an 8101 Storage and I/O unit). A directly attached loop operates at 9600 or 38.4K bps, and a data-link-attached loop operates at 1200 to 9600 bps. The loop speed selected is dependent on the capabilities of the attached devices and system requirements. Only one directly attached loop, or loop with a second lobe, per system can operate at 38.4K bps. (A lobe is defined as a portion of a loop that has a driver at one end of the lobe and a receiver at the other end of the lobe, neither of which is an I/O unit.) I/O units that are attachable to a directly attached loop are also attachable to a data-link-attached loop. All devices attached to a given loop must operate at the same loop speed. To facilitate single-terminal loop operation, IBM makes available a Single Loop Device Attachment Cable Assembly.

In addition to the capability for attaching a wide variety of I/O units, the loop design allows for error recovery and problem determination. The wrap capability in the loop station connector (LSC) and loop wiring connector (LWC) allows an alternate signal path to bypass a wiring failure on the loop; the bypass capability in the LWC allows a failing I/O unit or radial cable to be removed from the loop signal path, while allowing the remainder of the loop to operate normally. The LSC automatically bypasses the station and keeps the loop operational whenever an I/O unit is powered off or unplugged.

The loop configuration permits, without recabling or reprogramming, the relocation of devices on the loop to any other locations on the same loop where there are LSC's and power available. In conjunction with the bypass capability of the LSC, relocation and reconnection to the loop can be accomplished while the loop is operational. (Data may be lost during loop reconnection.)

A directly attached loop requires that the controlling unit have an SDLC Communication Adapter feature (1602) and a Loop Adapter feature (4830). In addition, a directly attached loop can have a second lobe if the Second Lobe feature (4835) is installed for that loop. The use of multiple lobes is recommended for increased I/O device availability for cabling alterations or failures, simpler installation planning and control, and greater loop cabling distance. In the event of a malfunction on one lobe or for planning alterations, the affected lobe can be bypassed, keeping all other lobes operational.

A data-link-attached loop requires an SDLC communications adapter with appropriate modems from the 8100 system to the site of the data-link-attached loop. At the remote site, a 3842 or 3843 Loop Control Unit provides the interface between the data link and the data link-attached loop. The 3842 contains a modem and runs at 2400 bps. The 3843 contains an RS-232 interface for an external modem and operates at 2400, 4800, or 9600 bps. The Second Lobe feature is not available on a data-link-attached loop.

The following IBM devices can be attached to loops controlled by the 8100: ►

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- ▶ • 3262 Printer, Models 2, 12.
- 3274 Control Unit, Model 51C.
- 3276 Control Unit/Display Station, Models 11, 12, 13, 14.
- 3287 Printer, Models 11, 12.
- 3289 Printer, Model 3.
- 3641 Reporting Terminal, Models 1, 2.
- 3642 Encoder Printer, Models 1, 2.
- 3643 Keyboard Display, Models 2, 3, 4.
- 3644 Automatic Data Unit.
- 3645 Printer.
- 3646 Scanner Control Unit.
- 8775 Display Station.

The IBM 3289 Model 3 Line Printer, the IBM 3274 Control Unit Model 51C, or the IBM 3276 Control Unit/Display Station can be attached to a directly attached or data-link-attached loop. I/O units can then be attached to these units as follows:

- 3289 Line Printer Model 3
 - 3501 Card Reader
 - 3782 Model 1 Card Attachment Unit; attaches to the 3521 Card Punch
 - 3782 Model 2 Card Attachment Unit; attaches to the 2502 Card Reader
- 3274 Control Unit Model 51C
 - 3262 Printer, Models 3, 13
 - 3277 Display Station, Models 1, 2
 - 3278 Display Station, Models 1, 2, 3, 4, 5
 - 3279 Color Display Station, Models 2A, 3A, 2B, 3B
 - 3284 Printer, Models 1, 2
 - 3286 Printer, Models 1, 2
 - 3287 Printer, Models 1, 2, 1C, 2C
 - 3288 Printer, Model 2
 - 3289 Printer, Models 1, 2
- 3276 Control Unit/Display Station, Models 11, 12, 13, 14
 - 3278 Display Station, Models 1, 2, 3, 4
 - 3287 Printer, Models 1, 2
 - 3289 Printer, Models 1, 2

SOFTWARE

OPERATING SYSTEMS: Two primary IBM licensed program products are currently available to support the 8100 system hardware. The Distributed Processing Control Executive (DPCX) is a display-oriented system designed to be implemented in an environment of strong central control. It

provides functions for interactive processing at the distributed site as well as between the host and the distributed site. DPCX is upward-compatible from the IBM 3790. The Distributed Processing Programming Executive (DPPX) is a general-purpose, transaction-oriented operating system that supports a number of optional licensed programs, including COBOL and FORTRAN.

Under DPCX, all program development is performed on the host computer. Under DPPX, programs are developed on the 8100 system. DPPX supports all the features and devices that can be attached to an 8100 system. The following are *not* supported by DPCX: card input/output, the 3640 series of industrial terminals, BSC or Start/Stop terminals, 8100-to-8100 communications, or double-lobe loops.

The *Distributed Processing Control Executive (DPCX)* is a programmable, multi-application, display-oriented control system that can control the execution of up to 31 user programs concurrently. Application programs written for the 3790 Communication System will run without change or recompilation under DPCX when the same or compatible devices are used. User data sets can be transferred via diskettes from 3790 disk storage to 8100 disk storage using a DPCX service routine.

DPCX and its host computer software allow users to distribute data and processing functions while retaining control at the host computer. The host-controlled functions include program development, distribution, and updating; systems design integrity; and network management. Applications, however, may run independently of the host, accessing local DPCX data bases and doing all the required processing locally. Conversely, applications may establish Systems Network Architecture (SNA) sessions with host applications, thus distributing processing and data between SPCX and host applications.

DPCX is supported by the ACF/VTAM, ACF/VTAME, ACF/TCAM, and EXTM host SNA access methods. VSAM and QSAM are also supported. The 8100 system is connected to the host via an SDLC line. System Control Program (SCP) support is provided by DOS/VS, DOS/VSE, OS/VS1, and OS/VS2 (MVS). In addition, DPCX is supported by a number of program products such as IMS/VS, CICS/VS, VSPC and TSO, DSX, RES/JES1, JES2, JES3, POWER/VS, and POWER/VSE. The DPCX application programmer can allow DPCX to manage all SNA protocols in the DPCX application program.

DPCX application programs are coded using the IBM 3790 programming statements. Thus, programs written for the 3790 can be run unchanged on an 8100 system under DPCX although the programs must be modified if they are coded for hardware not supported by DPCX. A DPCX application program can invoke a number of DPCX application services, such as transaction support, queued printing support, system-to-program support, display panel support, and interface-to-system services. Using DPCX statements, the application programmer can write programs to be run in a variety of modes, including batch, interactive, and conversational, with inquiry and data set updating.

In addition to programming the DPCX-controlled 8100 by means of IBM 3790 statements, the user can utilize the Development Management Service (DMS), a program product. DMS is a form-driven, prompt-response, interactive tool for generating display panels, display printer formats, and data definition sections of the application program.

Once a DPCX application program has been coded, it is prepared and tested by the 3790 host support program. Thus, all DPCX application programs are written and tested at the host location under control of the host data processing personnel. Only after the programs have been completed are

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- copies transmitted through the network to the various 8100/DPCX installations.

At the 8100 system, each DPCX application program is executed on a symbolic machine, and each symbolic machine consists of real storage resources (a set of buffers, registers, and condition indicators). Each symbolic machine is protected from access by other programs on the same 8100 system.

DPCX provides support that allows its users access to certain host applications. These functions are listed below.

- 3270 Data Stream Compatibility, which allows local or remote displays and display printers to be supported by existing 3270-based host applications.
- On-line printing to local or remote display printers supported by 3270-based host applications.
- An RJE package that includes on-line workstation support for host-based RJE applications and off-line functions, such as spooled printing and input editing with user exits.

The latest version of DPCX, Release 2, supports the Distributed Office Support Facility (DOSF), 8100/Distributed Office Support System (DISOSS), and 8100/Document Interchange Facility (DIF). These program products are designed to provide for the integration of text and data processing in the 8100. The new release also supports the 3732 Text Display Station, the 3736 Serial Printer, and the 6670 Information Distributor.

The *Distributed Processing Programming Executive (DPPX)* is made up of the DPPX/Base licensed program and its family of licensed programs. DPPX supports the 8130 and 8140 processors, the 8101 Storage and I/O unit (including disks and diskettes), the 8809 tape unit, and a wide variety of attachments for terminals, unit record devices, and system-to-system communication.

The major components of DPPX/Base include: the Supervisor, Command Facility, Data Management, and Interactive Editor. The Supervisor manages processor and error recovery; queues, locks, and timers; storage addresses and contents; and the Initial Program Load (IPL) function. DPPX/Base includes a set of commands used to define system environments, initiate work, and manage the operation of the system. The Command Facility interprets these commands and invokes other programs as needed to execute the commands. Commands can be executed interactively or in a batch mode. The Data Management portion of DPPX provides two access methods: the Relative Sequential Access Method (RSAM) and the Indexed Sequential Access Method (ISAM). RSAM provides direct access to records using a relative record or block number, as well as sequential access to records. ISAM maintains separate data sets for the indexes and the corresponding data records. The target data sets are RSAM-compatible. Up to eight indexes can be maintained for each data set. The Interactive Editor is used to enter and edit source programs, text, and data in either line edit or full-screen edit modes. The DPPX/Distributed Presentation Services program product is required for the full-screen capability. DPPX/Base also includes communications support, I/O device support, a linkage editor, an interactive debugging facility, a printer sharing program, and various general utilities.

Under DPPX the 8100 can communicate with other 8100, 4300 Series, or System/370 processors (or compatible processors, including the 3031, 3032, and 3033), or function as a stand-alone system.

The latest version of DPPX/BASE includes support for the new 8140 C dual-processor system, performance enhance-

ments with the 8140 C of up to 60 percent over an 8140 B, and system reliability and serviceability features. It also supports the CCITT X.21 network recommendation for upstream lines that are switched or leased and for leased downstream lines.

The DPPX family of licensed software programs includes:

- DPPX Assembler
- DPPX COBOL Compiler and COBOL Library
- DPPX FORTRAN Compiler and FORTRAN Library
- DPPX PL/1 Compiler and PL/1 Library
- DPPX Distributed Presentation Services
- DPPX Data Base and Transaction Management System
- DPPX Data Capture and Management System
- DPPX 3270 Data Stream Compatibility
- DPPX RJE Workstation Facility
- DPPX Interactive Productivity Facility
- DPPX Sort/Merge
- DPPX Development Management System
- DPPX Parameter Generation Facility for the IBM 3644 Automatic Data Unit
- DPPX/Performance Tool

DPPX/ASSEMBLER: A program product that translates source programs written in DPPX Assembler Language into 8100 machine language and processes macro instructions, both user-written and those that are included with DPPX/Base. The DPPX Assembler is useful primarily to the system programmer who has a need to replace portions of IBM-licensed program code, write original system code, or produce specialized interface programs and subroutines. IBM urges users to use high-level languages rather than Assembler language for application program development.

DPPX/COBOL: A program product that offers a COBOL compiler and a run-time library containing re-entrant routines that support arithmetic, logic, and data conversion, as well as input/output operations. Designed for application development, DPPX/COBOL includes language extensions that allow COBOL applications to utilize DPPX/DTMS (Data Base and Transaction Management System). A call interface is provided to allow interactive applications to use DPPX/DPS (Distributed Presentation Services). The COBOL program can be compiled and linked on one system, and the generated modules can be executed on another system on which the Run-Time Library has been installed.

DPPX/FORTRAN: A high-level, mathematically oriented programming language and compiler primarily suited to engineering and scientific applications. The language is designed according to the specifications of ANS FORTRAN X3.10-1966 and contains most of the basic specifications as well as additional features.

DPPX/PL/1: A program product that includes a PL/1 compiler and library with re-entrant routines. PL/1 programs can be used with other DPPX programs to provide access to interactive, data base, and presentation services available with the DPPX product. The PL/1 implementation in the 8100 conforms to the ANS X3.53-1976 standard. ►

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► **DPPX/DISTRIBUTED PRESENTATION SERVICES (DPS):** A program product providing device-independent control for terminals supported by DPPX, eliminating the need for data stream communication and buffer programming. DPPX/DPS consists of two components, Interactive Map Definition (IMD) and Format Management (FM). IMD enables the application programmer to create and update screen and printer panel layouts interactively at program development time. During the definition process, the programmer can see the run-time format being created at the display. Format Management (FM) is the execution-time component of DPS. FM can be used on systems without the IMD feature. In this case, maps must be created by IMD on an 8100 processor licensed for this feature.

DPPX/DATA BASE AND TRANSACTION MANAGEMENT SYSTEM (DTMS): Provides transaction management and routing as well as data base management and control for the 8100/DPPX system. Facilities to assist in developing, operating, and managing on-line applications are provided. The need for extensive user-developed system programs to manage terminals and data in this environment is greatly reduced.

DATA CAPTURE AND MANAGEMENT SYSTEM/DPPX: A data entry product that can simplify the design, setup, and execution of data entry applications. DCMS/DPPX consists of an interactive job definition program, an on-line executor for data capture, and two batch utility programs DCMS/DPPX local data interchange and statistical recording.

DPPX/3270 DATA STREAM COMPATIBILITY (DSC): A licensed program that allows certain keyboard display and printer units attached to the 8100 to communicate with System/370 host application programs as if the units were directly attached by data link to the host processor. The 8100 can be installed as a distributed processor while most existing 3270 applications at the System/370, 4300, or 303X host continue to run without change.

DPPX/REMOTE JOB ENTRY-WORKSTATION FACILITY (RJE): Permits the 8100 to function as an SNA or BSC remote job entry workstation for submitting jobs to a host 4300, 303X, or System/370. The host requires an OS/VS, DOS/VS, DOS/VSE, or VM/370 operating system with a job entry subsystem installed.

DPPX/SORT/MERGE (SORT): Provides a sort for the 8100 system that is designed to run with the DPPX/Base and provides users with facilities for extracting and sequencing data sets. DPPX/SORT is designed to address the user's need for sorting and merging of single or multiple types of records from one or more data sets. Related tasks, such as selecting certain records from one or more data sets, are also handled.

DEVELOPMENT MANAGEMENT SYSTEM (DMS)/DPPX: A program product that aids in the design and generation of application programs by providing a simple programming interface to the user. Programs generated by DMS/DPPX are executed by the DMS/DPPX Execution Facility, which operates in a batch environment under DPPX or interactively under DTMS.

DPPX/INTERACTIVE PRODUCTIVITY FACILITY: A simplified, full-screen interactive interface to the DPPX command facility. DPPX/IPF has three functional areas: systems use, for data set, catalog, and volume management; system operations, for remote site users to assist them in proper use of the 8100; and system management, for administrative and diagnostic activities. Tutorial routines are included that explain system functions.

DPPX/PARAMETER TABLE GENERATION FACILITY (GEN3644): Provides an efficient means for customizing the 3644 Automatic Data Unit (ADU). The 3644 ADU

attaches to the 8100 or the 3630 Plant Communication System and creates an automatic interface between the system and a wide variety of actuators, instruments, computers, and production subsystems. DPPX/GEN3644 customizing consists of selecting 3644 functions and specifying the initial values of stored data items. DPPX/GEN3644 translates the customization data into the format necessary for transmission to the 3644. Translation is performed by editing the source data and converting it into a parameter table format for loading into the 3644. The resulting parameter table works with the 3644 functions provided by IBM. DPPX/GEN3644 also produces a listing of the source data entered by the user. Extensive edits are performed both on a record basis and on an overall table basis. Errors noted on the 3644 program listing are corrected by changing the original input and resubmitting the job. The output of DPPX/GEN3644 is a sequential file containing the Parameter Table Load (PTL) data as required for transfer to the 3644. The records on the sequential file are 256 bytes long.

DPPX/PERFORMANCE TOOL (PT): A program product consisting of the DPPX/PT Monitor and the DPPX/PT Reporter feature. DPPX/PT monitors and reports the activity of components of the DPPX/Base program product. DTMS transaction statistics are also provided. The DPPX/PT Monitor collects performance data, and the DPPX/PT Reporter generates reports on the basis of data collected by the Monitor.

DISTRIBUTED PROCESSING DEVELOPMENT SYSTEM (DPDS): A Programming Request for Price Quotation (PRPQ) product that runs on the System/370, 4300, or 303X under MVS. DPDS enables systems programmers to code programs for an 8100 system running under DPPX and to compile and test them on the host before implementing them on the 8100. The package consists of a Programming Language for Distributed Systems (PL/DS) compiler with macro library, a linkage editor, and an 8100 simulator. DPDS can be used to develop new systems programs, extensions to DPPX/Base, or special I/O support for devices not supported by DPPX.

The programs described in the following paragraphs run on a System/370, 4300, or 303X host computer and can be used with both the DPCX and the DPPX operating systems.

DISTRIBUTED SYSTEMS EXECUTIVE (DSX): A set of routines and files that give IBM 8100 and 3790 system network users a simple and comprehensive means of data and network management. DSX combines, in one product, the host libraries, holding files, and control files, and the transmission, formatting, and reporting functions needed for library and transmission control in 8100 and 3790 system networks.

HOST COMMAND FACILITY: Designed to enable a host-attached terminal to function as if it were directly attached to an 8100/DPPX or DPCX system, the Host Command Facility gives the operator at a central System/370 site the capability to operate and control remote SDLC-connected 8100 systems. Nearly all maintenance, service, and control functions become available at the central System/370 site for problem determination, problem isolation, and remote system control. The System/370 must be running under MVS VTAM/TCAM, VSI VTAM/TCAM, or DOS/VS VTAM. Two new program products, DPPX/Problem Determination Application, and DPPX/Programmed Operator Facility, monitors DPPX applications programs and routes messages to the network operator, respectively.

PRICING

POLICY: IBM offers the 8100 Information System for purchase, monthly rental, or on a two-year lease. Rental and lease arrangements include prime-shift maintenance. ►

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► Purchased components may have a separate maintenance contract.

All 8100 system components listed in the accompanying price table are in maintenance category A, except the 8809 tape drives and the 3289-3 printer, which are in category D. These categories determine the schedule of extended maintenance charges. The two schedules differ for extended Monday-through-Friday maintenance. Prime-shift maintenance is provided for any consecutive nine-hour period between 7 a.m. and 6 p.m., Monday through Friday. The premium for extended maintenance is expressed in the table below as a percentage of the prime-shift maintenance charges, which are shown in the accompanying price list.

	Consecutive Hours				
	9*	12	16	20	24
Monday-Friday—					
Category A	10%	14%	18%	22%	26%
Category D	10	12	14	16	18
Saturday	4	5	7	8	9
Sunday	5	7	9	11	12

*For periods outside the basic 7 a.m. to 6 p.m. prime shift.

For users without a maintenance contract, the 8100 is maintained under per-call class 1. Under this class the per-call charge during regular hours is \$85.00 per hour, and during off hours the charge is \$99.00 per hour. The hourly rate for systems engineering service is \$79.00. Programming service/programming assistance costs \$123 per hour during regular hours and \$141 per hour outside regular hours.

The current Agreement for Lease or Rental of IBM Machines provides users with a single contract on which they can specify

mixtures of rental and leased equipment, each with various terms. CPU's rented under the plan can be terminated or downgraded on 90 days' notice, and all other rented equipment can be terminated or downgraded on 30 days' notice. Base terms and extension terms are specified for each piece of equipment through a leasing agreement.

The termination charge for the two-year lease arrangement is the lower of 5 months' charges or 25 percent of the remaining value of the lease. The lease arrangement also guarantees a maximum rate of increases for extended leasing periods; the rate for all 8100 components is five percent per year beginning in the second year.

All 8100 components qualify for unlimited usage. Purchase credits can be accrued up to a maximum of 55 percent. All components except the 8809 tape drives and 3289-3 printer are classified as Customer Set-Up, which permits (or requires) users to install the components themselves.

EQUIPMENT: The following are representative 8100 Information System configurations.

SIX-TERMINAL 8100 SYSTEM: Includes an 8130 processor with 384K bytes of memory, 58 million bytes of disk storage, three 3287 printers, six 3277 display terminals, and one 8101 Storage and I/O Unit with display/printer attachment. The purchase price is \$69,585. The same system can be leased for \$2,183 per month under a two-year lease agreement or rented for \$2,657 per month.

EIGHTEEN-TERMINAL 8100 SYSTEM: Includes an 8140 processor with 512K bytes of memory, 58 million bytes of disk storage, one 8809 magnetic tape drive, five 3287 printers, 18 8775 display terminals, and a communications loop. The purchase price is \$166,395. The same system can be leased for \$4,728 per month on a two-year lease or rented for \$5,554 per month.■

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Monthly Rental*	2-Year Lease*
PROCESSORS AND MAIN MEMORY					
8130	Basic processor; includes 256K bytes of main memory, up to 1-megabyte removable diskette storage, one disk module, disk storage as indicated, instruction set, up to eight I/O hardware interrupt levels, provisions for up to two communications ports:				
A21	29 megabytes disk storage	\$27,780	\$154.00	\$ 905	\$ 771
A22	23 megabytes disk storage, 131K fixed-head capacity	28,560	163.00	929	791
A23	64 megabytes disk storage	29,340	163.00	953	811
A24	58 megabytes disk storage, 131K fixed-head capacity	30,120	173.00	976	831
8140	Basic processor; includes main memory as indicated, 4K bytes non-programmable ROM, up to 64 megabytes disk storage with movable heads or up to 58 megabytes disk storage with removable and fixed heads, instruction set, eight I/O interrupt levels:				
A31	256K bytes of main memory, 29 megabytes disk storage	36,440	190.00	1,351	1,150
A32	256K bytes of main memory, 23 megabytes disk storage, 131K fixed-head capacity	37,220	200.00	1,374	1,170
A33	256K bytes of main memory, 64 megabytes disk storage	38,000	200.00	1,398	1,190
A34	256K bytes of main memory, 58 megabytes disk storage, 131K fixed-head capacity	38,780	208.00	1,421	1,210
A41	320K bytes of main memory, 29 megabytes disk storage, floating-point arithmetic	44,380	233.00	1,686	1,435
A42	320K bytes of main memory, 23 megabytes disk storage, 131K fixed-head capacity, floating-point arithmetic	45,160	243.00	1,709	1,455
A43	320K bytes of main memory, 64 megabytes disk storage, floating-point arithmetic	45,940	243.00	1,733	1,475
A44	320K bytes of main memory, 58 megabytes disk storage, 131K fixed-head capacity, floating-point arithmetic	46,720	251.00	1,756	1,495
A51	512K bytes of main memory, 29 megabytes disk storage	50,200	256.00	2,079	1,770
A52	512K bytes of main memory, 23 megabytes disk storage, 131K fixed-head capacity	50,980	266.00	2,103	1,790
A53	512K bytes of main memory, 64 megabytes disk storage	51,760	266.00	2,126	1,810
A54	512K bytes of main memory, 58 megabytes disk storage, 131K fixed-head capacity	52,540	274.00	2,150	1,830
A61	Processor with 768K bytes of memory and 29 megabytes of nonremovable disk	60,750	189.00	2,203	1,875
A62	Processor with 768K bytes of memory, 23 megabytes of nonremovable disk, and 131K bytes of fixed	61,530	198.00	2,226	1,895
A63	Processor with 768K bytes of memory and 64 megabytes of nonremovable disk	62,310	198.00	2,250	1,915
A64	Processor with 768K bytes of memory, 58 megabytes of nonremovable disk, and 131K bytes of fixed head disk	63,090	207.00	2,273	1,935
A71	Processor with 1024K bytes of memory and 29 megabytes of nonremovable disk	67,080	201.00	2,420	2,060
A72	Processor with 1024K bytes of memory, 23 megabytes of nonremovable fixed disk, and 131K bytes of fixed head disk	67,860	209.00	2,444	2,080

*Includes maintenance.

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EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Monthly Rental*</u>	<u>2-Year Lease*</u>
PROCESSORS AND MAIN MEMORY (Continued)					
A73	Processor with 1024K bytes of memory and 64 megabytes of nonremovable fixed disk	68,640	209.00	2,467	2,100
A74	Processor with 1024K bytes of memory, 58 megabytes of nonremovable fixed disk, and 131K bytes of fixed head disk	69,420	217.00	2,491	2,120
B51	Processor with 512K bytes of memory and 58 megabytes of nonremovable fixed disk, and 131K bytes of fixed head disk	59,730	228.00	2,220	1,890
B52	Processor with 512K bytes of memory and 123 megabytes of nonremovable fixed disk, and 131K bytes of fixed head disk	70,620	278.00	2,590	2,205
B61	Processor with 768K bytes of memory and 58 megabytes of nonremovable fixed disk, and 131K bytes of fixed head disk	66,060	238.00	2,437	2,075
B62	Processor with 768K bytes of memory and 123 megabytes of nonremovable fixed disk, and 131K bytes of fixed head disk	76,950	290.00	2,807	2,390
B71	Processor with 1024K bytes of memory, 58 megabytes of nonremovable fixed disk, and 131K bytes of fixed head disk	72,390	250.00	2,654	2,260
B72	Processor with 1024K bytes of memory, 123 megabytes of nonremovable fixed disk, and 131K bytes of fixed head disk	83,280	300.00	3,024	2,575
C72	Processor with 1024K bytes of memory, 123 megabytes of non-removable fixed disk, and 131K bytes of fixed head disk	100,130	318.00	3,666	3,120
C82	Processor with 1536K bytes of memory, 123 megabytes of non-removable fixed disk, and 131K bytes of fixed head disk	112,790	338.00	4,101	3,490
C92	Processor with 2048K bytes of memory, 123 megabytes of non-removable fixed disk, and 131K bytes of fixed head disk	125,450	358.00	4,535	3,860
1710	128K bytes additional storage for 8130 processor; maximum one per processor (cannot be used if 1720 storage is used)	2,595	9.00	103	88
1720	256K bytes additional storage for 8130 processor; maximum three per processor (cannot be used if 1710 storage is used)	5,190	18.00	206	176
1490	128K-byte storage increment for 8140 processor, models A31 through A34; maximum one per processor	6,540	33.00	324	276
8101	Storage and Input/Output Unit; provides additional disk storage and device attachment capability for 8130/40 processors; maximum two per 8130 processor, four per 8140 processor:				
A10	Device attachment capability	7,490	19.50	251	214
A11	Provides 29 megabytes disk storage with movable heads	16,820	64.00	574	489
A13	Provides 64 megabytes disk storage with movable heads	18,380	73.50	621	529
A20	Device attachment capability	6,470	14.00	219	187
A23	Provides 64 megabytes disk storage with movable heads	18,380	73.50	621	529
A25	Provides 129 megabytes disk storage with movable heads	29,270	127.00	991	844
PROCESSOR OPTIONS AND FEATURES					
Features for 8130 Processors:					
1520	Feature Expansion, Type I; allows four additional communications ports to be attached to 8130 processor for a maximum of six ports; required for attachment of two lobe loops or communications features requiring 5200 multi-speed clock; maximum one per processor	425	0.50	14	12
1530	System Expansion; provides additional interrupt levels; required for attachment of up to two 8101 Storage and Input/Output Units or one 8101 and one 8809 Magnetic Tape Unit, Model 1B, to processor; maximum one per processor	2,775	13.00	89	76
5500	Non-Switched Intergated Modem, 600/1200 bps; requires 1601 SDLC Communications Adapter with Clock or 1603 BSC/SS Communications with Clock	736	5.50	22	19
Features for 8140 B and C Model Processors:					
1701	Communications Adapter	460	0.50	15	13
3220	Display and Printer Attachment	3,120	18.00	112	95
3750	Floating Point Feature	4,710	25.50	170	145
3901	Feature Expansion Prerequisite; required for 1701	560	4.00	16	14
4901	Magnetic Tape Attachment	2,545	11.50	90	77
Features for 8130 and 8140 Processors Via The 8101 Storage and I/O Unit:					
1501	Display and Printer Attachment, Type I; provides attachment of 3277 display, 3287 printer, and 3284, 3286, or 3288 printers (8101 A11 and A13 units only); requires 1505/06 adapters	1,040	4.50	34	29
1502	Display and Printer Attachment, Type II; same as 1501 but requires 1503	463	1.00	15	13
1503	Communications Attachment, Type I; provides attachment of loops and communication ports (8101 A11 and A13 units only)	1,040	4.00	34	29
1504	Communications Attachment, Type II; same as 1503; requires 1503	463	0.50	15	13
1505	Display and Printer Adapter	2,660	17.50	95	81
1506	Additional Display and Printer Adapter	486	3.00	15	13
1507	Diskette Drive/Tape Attachment	1,035	4.50	33	28
INPUT/OUTPUT UNITS AND FEATURES					
4520	Second Diskette Drive for 8101 Storage and Input/Output Unit; 1 megabyte	3,325	31.50	119	101
4521	Magnetic Tape Attachment for 8101 Storage and Input/Output Unit	2,075	10.00	74	63
1507	Diskette Drive and Magnetic Tape Attachment for Model A10; required for attachment of one 4520 diskette drive and one 4521 magnetic tape attachment to 8101 Storage and Input/Output Unit, Model A10	1,035	4.50	33	28

*Includes maintenance.

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EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Monthly Rental*</u>	<u>2-Year Lease*</u>
INPUT/OUTPUT UNITS AND FEATURES (Continued)					
8010	Card Control Feature	963	1.50	34	29
8050	Card Reader Attachment for 3501 card reader	485	0.50	14	12
8149	Card Reader Attachment for 3782/2502	705	4.00	21	18
8150	Card Punch Attachment for 3782/3521	705	3.50	21	18
3262-2/3	Band Printer; 650 lpm with 48-character set	17,010	180.00	525	447
3262-12/13	Band Printer; 325 lpm with 48-character set	12,140	132.00	368	313
3284-1	Matrix Printer; 40 cps; 480-char. buffer	2,535	75.00	186	158
3284-2	Matrix Printer; 40 cps; 1920-char. buffer	2,845	75.00	200	170
3286-1	Matrix Printer; 66 cps; 480-char. buffer	3,385	89.50	224	191
3286-2	Matrix Printer; 66 cps; 1920-char. buffer	3,755	89.50	237	202
3287-1	Table-top Printer; 80 cps	5,960	41.50	222	189
3287-1C	Color Printer; 80 cps	6,430	47.00	274	233
3287-2	Table-top Printer; 120 cps	6,355	51.50	270	230
3287-2C	Color Printer; 120 cps	6,825	57.00	322	274
3287-11	Printer; 80 cps	6,165	46.00	257	219
3287-12	Printer; 120 cps	6,560	55.50	307	261
1120	APL Text Capability for 3287	183	0.50	6	5
3610	Extended Character Set Adapter	477	3.50	18	15
3880	Extended Print Buffer	220	0.50	7	6
4110	Friction Feed Paper Handling Feature	168	0.50	6	5
5781	Programmed Symbols PS-2	918	4.50	36	31
5782	Programmed Symbols PS-4	735	3.00	31	26
5783	Programmed Symbols PS-4A	1,650	13.00	66	56
8700	Variable width forms tractor	168	0.50	6	5
3288-2	Line Printer; 120 lpm	6,325	120.00	516	439
3289-1	Line Printer, 155 lpm	9,810	121.00	492	419
3289-2	Line Printer; 400 lpm	14,600	205.00	746	635
3289-3	Line Printer; 500 lpm	14,600	205.00	746	635
1090	Audible Alarm for 3289-1 or 3289-2 line printer	192	—	6	5
1130	Text Print Feature for 3289-1 or 3289-2 line printer	231	—	7	6
8809	Magnetic Tape Units:				
	1A First drive that attaches to 8101 Storage and I/O Unit	11,500	66.50	436	371
	1B First drive that attaches directly to 8130/40 processor	14,080	87.50	532	453
	2 Second or fourth drive that attaches to 1A/1B or 3, respectively	10,210	60.00	388	330
	3 Third drive that attaches to Model 2	11,500	66.50	436	371
4920	8100 System Multi-Drive Feature; required for 8809, Model 1B, if Model 2 or 3 is attached	396	2.00	14	12
3101-100	Model 10 Display Terminal; character transmission; RS-232-C interface	1,355	70.00	—	—
3101-110	Model 10 Display Terminal with modem cable; character transmission; RS-232-C interface	1,420	70.00	—	—
3101-120	Model 12 Display Terminal; character transmission; RS-232-C/20 ma current loop interface	1,380	70.00	—	—
3101-130	Model 13 Display Terminals; character transmission; RS-232-C/RS-422-A interface	1,380	70.00	—	—
3101-200	Model 20 Display Terminal; switch selectable character and block transmission; RS-232-C interface	1,565	80.00	—	—
3101-210	Model 20 Display Terminal with modem cable; switch selectable character and block transmission; RS-232-C interface	1,630	80.00	—	—
3101-220	Model 22 Display Terminal; switch selectable character and block transmission; RS-233-C/20 ma current loop interface	1,590	80.00	—	—
3101-230	Model 23 Display Terminal; switch selectable character and block transmission; RS-232-C/RS-422-A interface	1,590	80.00	—	—
3102	Thermal Printer; for attachment to 3101	1,295	130.00	—	—
3274-51C	Control Unit	5,805	57.50	214	182
3276-11	Display Station/Control Unit; 960-character display	5,750	33.00	222	189
3276-12	Display Station/Control Unit; 1920-character display	5,915	33.50	228	194
3276-13	Display Station/Control Unit; 2560-character display	6,750	34.50	231	197
3276-14	Display Station/Control Unit; 3440-character display	6,930	35.00	241	205
3277-1	Display Terminal; 480-character display	1,470	10.50	94	80
3277-2	Display Terminal; 1920-character display	1,905	22.00	136	116
3278-1	Display Terminal; 960-character display	1,985	13.00	75	64
3278-2	Display Terminal; 1920-character display	2,105	13.50	79	67
3279-2A	Display Terminal; Four Color, 1920-character Display	3,805	25.50	130	111
3279-2B	Display Terminal; Seven Color, 1920-character Display	4,210	28.00	142	121

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EQUIPMENT PRICES

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Monthly Rental*</u>	<u>2-Year Lease*</u>
INPUT/OUTPUT UNITS AND FEATURES (Continued)					
3279-3A	Display Terminal; Four Color; 2560-character Display	4,175	26.50	142	121
3279-3B	Display Terminal; Seven Color; 2560-character Display	4,580	29.00	155	132
1720	Switch Control Unit	180	—	5	4
4621	75-Key EBCDIC Typewriter Keyboard	446	2.50	15	13
4622	75-Key EBCDIC Data Entry Keyboard	446	3.50	15	13
4623	75-Key EBCDIC keypunch keyboard	446	3.50	15	13
4624	75-Key ASCII Typewriter Keyboard	446	2.50	15	13
4626	87-key EBCDIC Typewriter/APL keyboard	608	3.50	20	17
4627	87-key EBCDIC Typewriter keyboard	608	3.00	20	17
4628	87-key ASCII Typewriter keyboard	608	3.00	20	17
4629	87-key EBCDIC Typewriter/Text keyboard	608	3.50	20	17
4640	87-key EBCDIC Typewriter Overlay Keyboard	608	3.50	20	17
4651	87-key EBCDIC Attribute Select Typewriter keyboard	608	3.50	20	17
4652	87-key EBCDIC Attribute Select Typewriter/APL keyboard	608	3.50	20	17
4690	Keyboard Numeric Lock	NC	NC	NC	NC
4999	Magnetic Reader Control	365	4.50	13	11
5781	Programmed Symbols DS-2	486	1.50	16	14
5782	Programmed Symbols PS-4	810	4.00	28	24
6340	Security Keylock	35	NC	35***	—
6350	Selector Light Pen for Models 3A or 3B	527	0.50	18	15
6350	Selector Light Pen for Models 2A or 2B	527	0.50	18	15
8775-1	Display Terminal; up to 2560 characters in 9 x 16 matrix	3,120	22.00	94	80
8775-2	Display Terminal; up to 2560 characters in 9 x 16 matrix or 3440 characters in 9 x 12 matrix	3,515	22.00	105	89
1090	Audible Alarm	99	NC	2	2
3622	Feature Storage	793	3.50	22	19
3624	Enhanced Function; requires 3622 feature storage and 3905 feature adapter	NC	NC	NC	NC
3905	Feature Adapter; requires 3622 feature storage and 3624 enhanced function	446	2.00	13	11
4621	75-Key Typewriter Keyboard	446	2.50	15	13
4622	75-Key Data Entry Keyboard	446	4.00	15	13
4623	75-Key Data Entry Keyboard with keypunch layout	446	4.00	15	13
4626	87-Key Typewriter; APL	608	3.50	20	17
4627	87-Key Typewriter	608	3.00	20	17
4850	Loop Adapter	346	2.00	8	7
4999	Magnetic Reader Control	425	2.50	13	11
6350	Selector Light Pen	614	1.00	18	15
3640 PLANT COMMUNICATION DEVICES					
3641-1	Reporting Terminal	3,415	14.00	—	115**
3641-2	Reporting Terminal	4,080	16.00	—	135**
3642-1	Encoder Printer	6,675	31.50	—	243**
3642-2	Encoder Printer	7,895	38.00	—	288**
3643-2	Keyboard Display	2,835	29.50	—	125**
3643-3	Keyboard Display	3,930	37.00	—	169**
3643-4	Keyboard Display	4,145	39.00	—	175**
3644	Automatic Data Unit	6,060	29.00	—	221**
4905	Manual I/O	1,705	5.50	—	58**
3645	Receive-Only Printer	5,435	44.00	—	243**
3646	Scanner Control Unit	2,950	11.00	—	98**
6351	Magnetic Reader Attachment	728	3.00	—	22**
3631	Plant Communication Controller:				
	1A 250K-byte diskette	30,430	224.00	1,269	1,080
	1B 500K-byte diskette	32,740	247.00	1,357	1,155
3632	Plant Communication Controller:				
	1A 5-megabyte disk	51,620	273.00	1,956	1,665
	1B 9.2-megabyte disk	55,080	281.00	2,074	1,765
1006	Additional Storage Feature	1,225	10.00	63	54
3211	Data Link Adapter	1,320	10.50	42	36
3701	EIA/CCITT Host	490	4.00	14	12
3703	EIA/CCITT Data Link	467	4.00	14	12
4780	Loop Adapter	1,085	17.50	38	32
4502	SDLC Communications Feature without clocking; to 9600 bps	1,385	10.50	42	36
6301	Host Communications Feature with clocking	782	3.00	21	18
6302	Host Communications Feature without clocking	570	2.50	12	10
1010/11	Additional Disk Heads for 3632 Plant Communications Controller	1,130	17.00	36	31

*Includes maintenance.

**5-year lease.

***One-time charge.

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COMMUNICATIONS					
4850	Loop Adapter	945	3.50	25	21
3842	Loop Control Unit	6,625	44.50	—	269**
3843	Loop Control Unit	5,155	28.00	170	145
1051	Alternate Voice	525	2	—	17**
5101	Multipoint Tributary	490	4	—	19**
6101	Point-to-Point	244	2	—	10**
7951	Switched Network Back-Up Manual Answer	578	7	—	29**
1550	CCITT V.35 Interface; up to 9600 bps	561	2.00	18	15
1601	SDLC Communications Adapter with Clock	1,040	8.50	52	44
1602	SDLC Communications Adapter without Clock	972	8.00	41	35
1603	BSC/SS Communications Adapter with Clock	774	3.00	22	19
1604	BSC Communications Adapter without Clock	519	2.50	14	12
3701	EIA RS-232C Interface	441	4.00	14	12
4545	Expanded Function Operator Panel (8140 processor only)	2,775	33.50	103	88
4830	Loop Adapter	699	4.00	24	20
4835	Loop Adapter, Second Lobe	699	4.00	24	20
5200	Multi-Speed Clock	486	1.50	15	13
5501	Switched Integrated Modem	972	7.00	32	27
5655	CCITT X.21 Interface, non-switched networks; for 8101 Models A20-A25, 8130 (all models), 8140 B (all models)	770	2.00	26	22
5656	CCITT X.21 Interface, switched networks; for 8101 Models A20-A25, 8130 (all models), 8140 B (all models)	945	2.00	32	27
5660	Digital Data Service Adapter (DDSA)	972	2.00	31	26
8140 C Communications Ports Features:					
1610	Two direct attach loops, two SDLC/RS-232-C interfaces	6,168	48.00	240	204
1611	Three direct attach loops, one SDLC/RS-232-C interface	6,426	48.00	250	212
1612	Three direct attach loops, one SDLC/CCITT X.21 switched interface	6,930	46.00	268	227
1613	Three direct attach loops, one SDLC/CCITT X.21 non-switched interface	6,755	46.00	262	222
1614	Three direct attach loops, one SDLC/CCITT V.35 interface	6,546	46.00	254	215
1620	Three SDLC/RS-232-C interfaces, one direct attach loop	6,370	48.50	245	209
1621	Four SDLC/RS-232-C interfaces	6,112	48.50	235	201
1630	Two SDLC/RS-232-C interfaces	3,286	24.50	125	107

*Includes maintenance.

**5-year lease.

***One-time charge.

SOFTWARE PRICES

		<u>Monthly License Fee Basic</u>	<u>Monthly License Fee DSLO</u>
5761-DS1	Distributed Processing Control Executive (DPCX)	\$234	\$175
	Distributed Processing Programming Executive (DPPX):		
5760-010	DPPX/Base	208	156
5760-AS1	DPPX/ASSM	55	41
5760-CB1	DPPX/COBOL Compiler	106	79
5760-LB1	DPPX/COBOL Run-Time Library	18	13
5760-FO1	DPPX/FORTRAN Compiler	84	63
5760-LM1	DPPX/FORTRAN Library	41	30
5760-XR1/01	DPPX/DPS Interactive Map Definition	90	67
5760-XR1/02	DPPX/DPS Format Management	35	26
5760-TD1	DPPX/DTMS (Data Base and Transaction Management System)	108	81
5760-RC1	DPPX/DSC (Data Stream Compatibility)	18	13
5760-XC1	DPPX/RJE	28	21
5760-SM1	DPPX/Sort/Merge	24	18
5760-XC2	DMS/DPPX	102	77
5760-ED1	DPPX/GEN3644	21	15
5748-XXG	Distributed Systems Executive (DSX)	192	—
5735-XR1	Host Command Facility for 8100/DPCX systems	84	63
5760-XR5/01	DPPX/PT Monitor	42	—
5760-XR5/02	DPPX/PT Reporter Feature	48	—
5760-271	DPPX/Interactive Productivity Facility	25	18
5760-PL1	DPPX/PL/1 Compiler	290	217
5760-LM2	DPPX/PL/1 Library	50	37
5760-XR6	Data Capture and Management System/DPPX	83	62