IBM 8100 Information System

MANAGEMENT SUMMARY

The 8100 Information System was announced in October 1979. Since that time, IBM has continued to add new hardware and software to the system. New processor submodels, new color displays and printers, a new remote loop control unit, and enhanced software were all announced during the past year.

The 8100 system is broad in scope. Two operating systems are available. One, the Distributed Processing Programming Executive (DPPX), provides substantial stand-alone processing capabilities for an 8100 system, including COBOL and FORTRAN 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 — but an equivalent 8100 processor is only about half the price of a 3791.

The 8100 processor architecture is impressive. Each 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 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-, and 32-bit operands. Memory capacity ranges from 256K to 1024K bytes for both processors.

Each processor contains fixed-disk storage, a diskette drive, a limited number of ports for connecting terminals, and provisions for expanding the disk storage and port capacities through one or more 8101 Storage and I/O Units. The parameters of each model are thoroughly described in the Characteristics section of this report.

The capabilities of the various processor models can be most easily understood by regarding them as nine groups ▷

The 8100 can operate as either a stand-alone system or a distributed processing system. It supports up to 1024K bytes of memory, 639 megabytes of disk storage, and 4 magnetic tape drives. A wide variety of printers and display terminals can be connected to an 8100 system.

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 26 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.

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. ▶
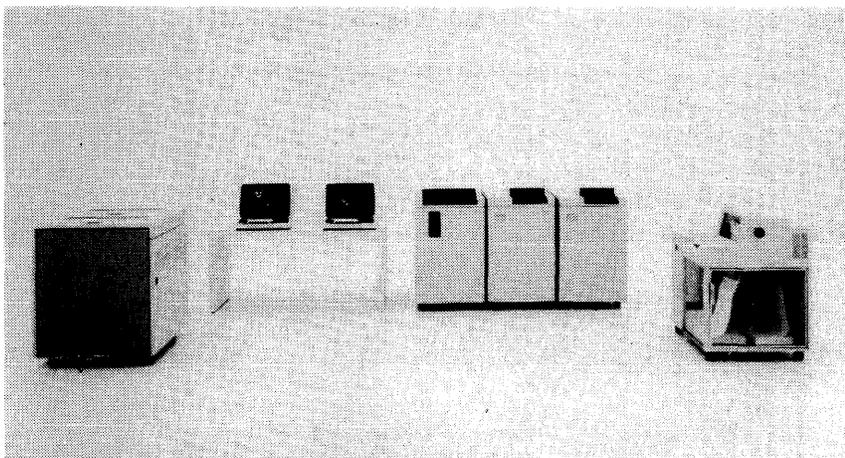
This IBM 8100 configuration includes, from left to right: two 8809 Magnetic Tape Units, two 8775 Display Terminals; an 8100 Processor, two 8101 Storage and I/O units, and a 3289 Line Printer, Model 3. An 8100 system can support up to 1024K bytes of memory and 639 megabytes of disk storage.

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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

*The base main storage in the 8140 models contains 4K bytes of non-programmble read-only storage.
**Plus 131K bytes of fixed-head disk storage.
***These features are mutually exclusive on the 8140-A41, A42, A43, and A44.

▷ of two or four models each: 8130 A2X, 8140 A3X, 8140 A4X, 8140 A5X, 8140 A6X, 8140 A7X, 8140 B5X, 8140 B6X, and 8140 B7X. Within each of these groups (except the 8140 B models), two models provide 29 and 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; 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 ▷

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, or 1,048,576 bytes.

CHECKING: A parity bit with each byte is generated during writing and checked during reading.

STORAGE PROTECTION: The dynamic address relocation mechanism provides storage protection in the form of logical address space isolation. The mechanism ensures that ▶

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PERIPHERALS/TERMINALS

DEVICE	DESCRIPTION & SPEED
MAGNETIC TAPE EQUIPMENT	
8809	9-track; 1600 bpi, phase-encoded; 12.5 ips in start/stop mode, 100 ips in streaming mode; 20 KBS in start/stop mode, 160 KBS in streaming mode
CARD EQUIPMENT	
3501	Reader; 80-column; 50 cpm (maximum)
	Reader; 80-column; 150 cpm
	Punch; 80-column; 50 cpm (maximum)
PRINTER EQUIPMENT	
3262-2	Band printer; 650 lpm with 48-character set; 64- and 96-character sets available; 288-character buffer
3262-3	Band printer; 650 lpm with 48-character set; 64-, 96-, and 128-character sets available; 288-character buffer
3262-12	Band printer; 325 lpm with 48-character set; 64- and 96-character sets available; 288-character buffer
3262-13	Band printer; 325 lpm with 48-character set; 64-, 96-, and 128-character sets available; 288-character buffer
3284-1	Matrix printer; 40 cps; 480-character buffer
3284-2	Matrix printer; 40 cps; 1920-character buffer
3286-1	Matrix printer; 66 cps; 480-character buffer
3286-2	Matrix printer; 66 cps; 1920-character buffer
3287-1	Table-top printer; 80 cps; bidirectional
3287-1C	Color printer; 80 cps; bidirectional
3287-2	Table-top printer; 120 cps; bidirectional
3287-2C	Color printer; 120 cps; bidirectional
3287-11	Table-top printer; 80 cps; bidirectional; includes loop attachment
3287-12	Table-top printer; 120 cps; bidirectional; includes loop attachment
3288-2	Line printer; 120 lpm; 1920-character buffer
3289-1	Line printer; 155 lpm; 48-character set
3289-2, 3	Line printer; 400 lpm; 48-character set
3642-1	Encoder printer; drum; 48-character set, hand feed
3642-2	Encoder printer; drum; 48-character set, automatic feed
3645	Matrix printer; 120 cps; bidirectional; 132 positions, 94-character set
TERMINALS	
2741	Communication terminal; modified Selectric typewriter
3101-10/12/13	Keyboard/display station; 80 cpl; 1920-character display; up to 9600 bps; character transmission
3101-20/22/23	Keyboard/display station; 80 cpl; 1920-character display; up to 9600 cps; character and block transmission
3274-51C	Control unit; controls up to 12 3277, 3278, or 3279 display stations and 3262, 3284, 3287, 3288, or 3289 printers
3276-11	Keyboard/display station/control unit; 40 cpl; 960-character display; up to 9600 bps
3276-12	Keyboard/display station/control unit; 80 cpl; 1920-character display; up to 9600 bps
3276-13	Keyboard/display station/control unit; 80 cpl; 2560-character display; up to 9600 bps
3276-14	Keyboard/display station/control unit; 80 cpl; 3440-character display; up to 9600 bps
3277-1	Keyboard/display station; light pen; 40 cpl; 480-character display
3277-2	Keyboard/display station; light pen; 80 cpl; 1920-character display
3278-1	Keyboard/display station; 40 cpl; 960-character display
3278-2	Keyboard/display station; 80 cpl; 1920-character display
3279-2A	Color display station; 80 cpl; 4-color, 1920-character display
3279-2B	Color display station; 80 cpl; 7-color, 1920-character display
3279-3A	Color display station; 80 cpl; 4-color, 2560-character display
3279-3B	Color display station; 80 cpl; 7-color, 2560-character display
3641-1, 2	Reporting terminal; 35- or 70-position keyboard; 22-position display; 5 x 7 dot matrix; up to 9600 bps
3643-2	Keyboard/display; gas panel display; 40 cpl; 240-character display; 7 x 9 dot matrix; up to 9600 bps
3643-3	Keyboard/display; gas panel display; 40 cpl; 480-character display; 7 x 9 dot matrix; up to 9600 bps
3643-4	Keyboard/display; gas panel display; 40 cpl; 1024-character display; 5 x 7 dot matrix; 9600 bps

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PERIPHERALS/TERMINALS

DEVICE	DESCRIPTION & SPEED
TERMINALS	
3767-1	Communication terminal, desk-top; 40 cps; bidirectional; 512-byte buffer (optional)
3767-2	Communication terminal, desk-top; 80 cps; bidirectional; 512-byte buffer (basic)
3767-3	Communication terminal, desk-top; 120 cps; bidirectional; 512-byte buffer (basic)
8775-1	Keyboard/display; light pen; 2560-character display; 9 x 16 dot matrix; ; 93-character set; up to 9600 bps
8775-2	Keyboard/display; light pen; 2560-character display, 9 x 16 dot matrix or 3440-character display, 9 x 12 dot matrix; 94-character set; up to 9600 bps

8130/8140 SYSTEM MAXIMUMS

	8130 A21-A24	8140 A31-A34	8140 A41-A44	8140 A5X, A6X, A7X	8140 B Models
8101 Storage and I/O Units*	2	4	4	4	4
Disk Drives (total)**	3	5	5	5	6
Disk capacity	320 MB	580 MB	580 MB	580 MB	640 MB
Diskette drives	2	2	2	2	2
8809 tape drives	4	4	4	4	4
327X/328X direct-attached displays/printers	24	24	24	24	24
Communication ports—					
Loops, SDLC/BSC/SS links***	14	19	18	16	19
38.4-KB loops	1	1	1	1	1
Total loops	14	19	18	16	19
Aggregate BSC/SS data rate (bps/cps)	9600/330	19,200/660	19,200/660	19,200/660	19,200/660

*Only one 8101 may have communication and display printer features with the B Models of the 8140 while the A Models allow two 8101s to have these features.
**Includes disk drive in processors and in each 8101 unit.
***Only 10 SDLC ports can be active at one time.

▷ 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, 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 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 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

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 registers 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 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 ▶

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

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-232C 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. 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

IBM began delivering the 8100 system in August 1979, so none of the users have had more than a few months' experience with it. Only three users of the 8100 system ▷
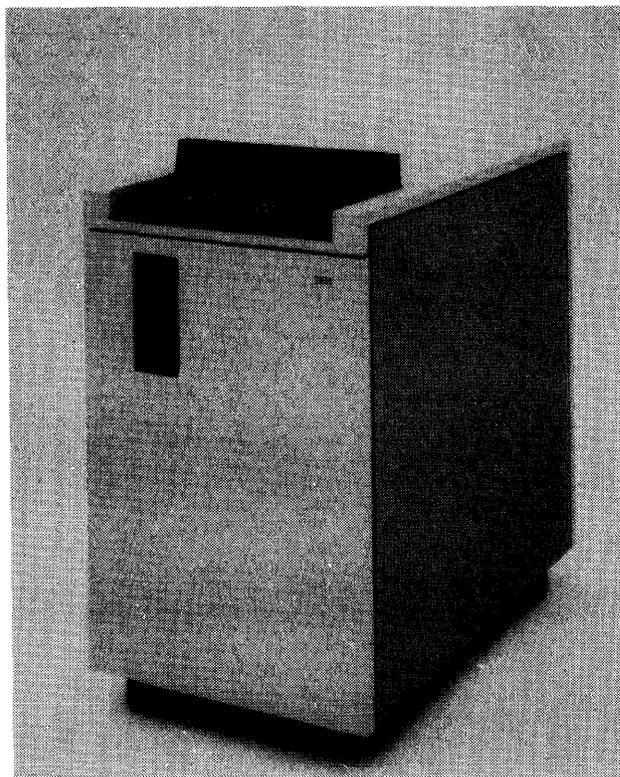
The 8140 processor is shown with the Expanded Function Operator Panel (EFOP). Supplied in addition to the basic panel as a program diagnostic aid, the EFOP provides programmer and operator access to storage, program stop and restart capability, and current operating indicators.

▶ 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. ▶

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responded to Datapro's 1980 survey of computer system users. Consequently, we contacted four additional users in April 1980, but only one of them felt the system had been installed long enough for them to provide meaningful ratings or comments.

The four users who did provide ratings had a total of five 8100 systems with 33 workstations installed. Two of them were renting the equipment and two were leasing it. The reported length of usage ranged from three months to seven months. Only one of these installations included 8140 processors; the others were using 8130's.

Of the users surveyed, one was using the 8100 primarily for accounting and distributed processing applications, one for financial applications, one for manufacturing and transaction processing applications, and one for distributed processing and transaction processing applications.

The table below summarizes the users' ratings of the 8100 system. Because all four of the installations were using the DPCX operating system, which does not include a compiler and did not initially support applications programs, we have omitted those categories.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	3	1	0	0	3.7
Reliability of mainframe	2	2	0	0	3.5
Reliability of peripherals	0	4	0	0	3.0
Maintenance Service:					
Responsiveness	2	2	0	0	3.5
Effectiveness	2	2	0	0	3.5
Technical support:					
Trouble-shooting	2	2	0	0	3.5
Education	2	1	1	0	3.2
Documentation	2	1	1	0	3.2
Operating system	1	3	0	0	3.2
Ease of conversion	3	1	0	0	3.7
Overall satisfaction	2	2	0	0	3.5

*Weighted Average on a scale of 4.0 for Excellent.

The above ratings indicate a high degree of user satisfaction thus far. When asked to name the primary advantages of the 8100 system, three users mentioned fast response time, three mentioned compatibility with programs and data carried over from other systems, and two mentioned compatibility with terminals and peripherals carried over from other systems. One user, who had acquired the 8100 system as a replacement for a 3790 system, was pleased with the additional capabilities and applications available on the 8100.

Only two of the users had experienced any problems with the system. One stated that he had experienced "excessive" hardware problems during installation. The other, who was using the 8100 as a remote 3270 controller for an on-line IMS system, said that the 8100 "couldn't handle the 56K-bps data link" used for host communications. He also reported some problems with the 3284 printer, which he said were based on the microcode.

All four of the users surveyed said they would recommend the 8100 system to others with similar applications.□

- **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 in the 8140 Models A41, A42, A43, and A44.

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. 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.

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 ▶

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the 8140 can attach up to 11, depending on the model. Some 8140 models offer hardware floating-point arithmetic. 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 8101's. The 8101 allows expansion of the system's communication and I/O capabilities, as well as additions to disk storage. The 8101 is available in six models; Model A10 and A20 have no disk storage, Model A11 has 29 million bytes of disk storage, Model 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 8101's 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 8101's 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, ony three 8101's 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.

See the 8130/8140 Components table for the various 8130 and 8140 models and their components, and the System Maximums table for the types and number of units that can be attached to the various processor models.

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 A11 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. The 8130/8140 Components table shows the disk storage capacities of the various processor models.

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

Please refer to the Peripherals/Terminals table on the third page of this report.

COMMUNICATIONS CONTROL

Each communications adapter in a 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.

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.

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➤ 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:

- 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. ➤

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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 doule-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 supportd by the ACF/VTAM, ACF/VTAME, ACF/TCAM, and EXTM host SNA acess methods. The 8100 system is connected to the host via an SDLC line. System Control Program (SCP) support is provided by DOS/VS, DOS/VE, OS/VS1, OS/VS2 (SVS), 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, and POWER/VS. 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 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 *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 Distributed Access Method (DXAM). RSAM provides direct access to records using a relative record or block number, as well as sequential access to records. DXAM is an indexed sequential access method that 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 systems, communicate with System/370 processors (or compatible processors, including the 3031, 3032, and 3033), or function as a stand-alone system.

The DPPX family of licensed software programs includes:

● DPPX Assembler

● DPPX COBOL Compiler and COBOL Library

● DPPX FORTRAN Compiler and FORTRAN Library

● DPPX Distributed Presentation Services

● DPPX Data Base and Transaction Management System

● DPPX 3270 Data-Stream Compatibility

● DPPX RJE Workstation Facility

● DPPX Sort/Merge

● DPPX Development Management System

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➤ • 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 Assember 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/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.

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 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 System/370. The host requires an OS/VS 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 users' 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/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 under MVS. DPDS enables systems programmers to code programs for an 8100 system running under DPPX and to compile and test them on the System/370 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 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 System/370 attached terminal to function as if it were directly ➤

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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, VS1 VTAM/TCAM, or DOS/VS VTAM.

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. 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 $61.00 per hour, and during off hours the charge is $71.00 per hour. The hourly rate for systems engineering service is $66.00. Programming service/programming assistance costs $89 per hour during regular hours and $102 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 $64,090. The same system can be leased for $1,864 per month under a two-year lease agreement or rented for $2,191 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 $149,672. The same system can be leased for $4,202 per month on a two-year lease or rented for $4,940 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	$25,200	$128.00	$754	$642
A22	23 megabytes disk storage, 131K fixed-head capacity	25,950	136.00	778	662
A23	64 megabytes disk storage	26,700	136.00	801	682
A24	58 megabytes disk storage, 131K fixed-head capacity	27,450	144.00	825	702
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	34,710	181.00	1,204	1,025
A32	256K bytes of main memory, 23 megabytes disk storage, 131K fixed-head capacity	35,460	190.00	1,228	1,045
A33	256K bytes of main memory, 64 megabytes disk storage	36,210	190.00	1,251	1,065
A34	256K bytes of main memory, 58 megabytes disk storage, 131K fixed-head capacity	36,960	198.00	1,275	1,085
A41	320K bytes of main memory, 29 megabytes disk storage, floating-point arithmetic	42,270	222.00	1,510	1,285
A42	320K bytes of main memory, 23 megabytes disk storage, 131K fixed-head capacity, floating-point arithmetic	43,020	231.00	1,533	1,305
A43	320K bytes of main memory, 64 megabytes disk storage, floating-point arithmetic	43,770	231.00	1,557	1,325
A44	320K bytes of main memory, 58 megabytes disk storage, 131K fixed-head capacity, floating-point arithmetic	44,520	239.00	1,580	1,345

*Includes maintenance.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Monthly Rental*	2-Year Lease*
PROCESSORS AND MAIN MEMORY (Continued)					
A51	512K bytes of main memory, 29 megabytes disk storage	47,810	244.00	1,857	1,580
A52	512K bytes of main memory, 23 megabytes disk storage, 131K fixed-head capacity	48,560	253.00	1,880	1,600
A53	512K bytes of main memory, 64 megabytes disk storage	49,310	253.00	1,904	1,620
A54	512K bytes of main memory, 58 megabytes disk storage, 131K fixed-head capacity	50,060	261.00	1,927	1,640
A61	Processor with 768K bytes of memory and 29 megabytes of nonremovable disk	57,860	180.00	1,968	1,570
A62	Processor with 768K bytes of memory, 23 megabytes of nonremovable disk, and 131K bytes of fixed	58,610	189.00	1,992	1,695
A63	Processor with 768K bytes of memory and 64 megabytes of nonremovable disk	59,360	189.00	2,015	1,715
A64	Processor with 768K bytes of memory, 58 megabytes of nonremovable disk, and 131K bytes of fixed head disk	60,110	197.00	2,039	1,735
A71	Processor with 1024K bytes of memory and 29 megabytes of nonremovable disk	63,900	191.00	2,174	1,850
A72	Processor with 1024K bytes of memory, 23 megabytes of nonremovable fixed disk, and 131K bytes of fixed head disk	64,650	199.00	2,197	1,870
A73	Processor with 1024K bytes of memory and 64 megabytes of nonremovable fixed disk	65,400	199.00	2,221	1,890
A74	Processor with 1024K bytes of memory, 58 megabytes of nonremovable fixed disk, and 131K bytes of fixed head disk	66,150	207.00	2,244	1,910
B51	Processor with 512K bytes of memory and 58 megabytes of nonremovable fixed disk, and 131K bytes of fixed head disk	54,190	217.00	1,857	1,580
B52	Processor with 512K bytes of memory and 123 megabytes of nonremovable fixed disk, and 131K bytes of fixed head disk	64,580	265.00	2,197	1,870
B61	Processor with 768K bytes of memory and 58 megabytes of nonremovable fixed disk, and 131K bytes of fixed head disk	60,220	227.00	2,056	1,750
B62	Processor with 768K bytes of memory and 123 megabytes of nonremovable fixed disk, and 131K bytes of fixed head disk	70,610	276.00	2,397	2,040
B71	Processor with 1024K bytes of memory, 58 megabytes of nonremovable fixed disk, and 131K bytes of fixed head disk	66,250	238.00	2,256	1,920
B72	Processor with 1024K bytes of memory, 123 megabytes of nonremovable fixed disk, and 131K bytes of fixed head disk	76,640	286.00	2,597	2,210
1710	128K bytes additional storage for 8130 processor; maximum one per person (cannot be used if 1720 storage is used)	2,360	7.50	87	74
1720	256K bytes additional storage for 8130 processor; maximum three per processor (cannot be used if 1710 storage is used)	4,720	15.00	175	149
1490	128K-byte storage increment for 8140 processor, models A31 through A34; maximum one per processor	6,540	31.50	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	6,820	17.50	213	181
A11	Provides 29 megabytes disk storage with movable heads	15,710	58.00	508	432
A13	Provides 64 megabytes disk storage with movable heads	17,230	66.50	560	477
A20	Device attachment capability	5,880	13.00	186	158
A23	Provides 64 megabytes disk storage with movable heads	17,230	66.50	560	477
A25	Provides 129 megabytes disk storage with movable heads	27,620	115.00	901	767

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	2,520	11.00	75	64
5500	Non-Switched Intergated Modem, 600/1200 bps; requires 1601 SDLC Communications Adapter with Clock or 1603 BSC/SS Communications with Clock	668	5.00	20	17

Features for 8140 B Model Processors:

1701	Communications Adapter	420	0.50	13	11
3220	Display and Printer Attachment	2,835	17.00	94	80
3750	Floating Point Feature	4,280	24.50	143	122
3901	Feature Expansion Prerequisite; required for 1701	525	4.00	14	12
4901	Magnetic Tape Attachment	2,310	11.00	76	65

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	945	4.00	28	24
1502	Display and Printer Attachment, Type II; same as 1501 but requires 1503	420	0.50	13	11
1503	Communications Attachment, Type I; provides attachment of loops and communication ports (8101 A11 and A13 units only)	945	4.00	28	24

*Includes maintenance.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Monthly Rental*	2-Year Lease*
PROCESSOR OPTIONS AND FEATURES (Continued)					
1504	Communications Attachment, Type II; same as 1503; requires 1503	420	0.50	13	11
1505	Display and Printer Adapter	2,415	15.50	80	68
1506	Additional Display and Printer Adapter	441	3.00	13	11
1507	Diskette Drive/Tape Attachment	940	4.00	27	23
INPUT/OUTPUT UNITS AND FEATURES					
4520	Second Diskette Drive for 8101 Storage and Input/Output Unit; 1 megabyte	3,020	28.50	100	85
4521	Magnetic Tape Attachment for 8101 Storage and Input/Output Unit	1,890	9.00	62	53
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	940	4.00	27	23
8010	Card Control Feature	875	1.50	29	25
8050	Card Reader Attachment for 3501 card reader	440	0.50	13	11
8149	Card Reader Attachment for 3782/2502	640	4.00	19	16
8150	Card Punch Attachment for 3782/3521	640	3.50	19	16
3262-2/3	Band Printer; 650 lpm with 48-character set	14,700	157.00	439	374
3262-12/13	Band Printer; 325 lpm with 48-character set	10,500	115.00	307	262
3284-1	Matrix Printer; 40 cps; 480-char. buffer	2,980	56.50	157	134
3284-2	Matrix Printer; 40 cps; 1920-char. buffer	3,345	56.50	167	142
3286-1	Matrix Printer; 66 cps; 480-char. buffer	3,985	62.00	189	161
3286-2	Matrix Printer; 66 cps; 1920-char. buffer	4,415	62.00	200	170
3287-1	Table-top Printer; 80 cps	5,960	49.00	187	159
3287-1C	Color Printer; 80 cps	6,430	55.50	230	196
3287-2	Table-top Printer; 120 cps	6,355	60.50	227	193
3287-2C	Color Printer; 120 cps	6,825	67.00	271	231
3287-11	Printer; 80 cps	6,165	54.00	217	185
3287-12	Printer; 120 cps	6,560	65.50	257	219
1120	APL Text Capability for 3287	183	0.50	6	5
3610	Extended Character Set Adapter	477	4.00	15	13
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	5.50	31	26
5782	Programmed Symbols PS-4	735	3.50	25	21
5783	Programmed Symbols PS-4A	1,650	15.00	56	48
8700	Variable width forms tractor	168	0.50	6	5
3288-2	Line Printer; 120 lpm	7,440	100.00	431	367
3289-1	Line Printer, 155 lpm	9,345	110.00	411	350
3289-2	Line Printer; 400 lpm	13,910	187.00	623	530
3289-3	Line Printer; 500 lpm	13,910	187.00	623	530
1090	Audible Alarm for 3289-1 or 3289-2 line printer	183	—	6	5
1130	Text Print Feature for 3289-1 or 3289-2 line printer	220	—	7	6
8809	Magnetic Tape Units:				
	1A First drive that attaches to 8101 Storage and I/O Unit	10,960	50.00	364	310
	1B First drive that attaches directly to 8130/40 processor	13,410	66.00	445	379
	2 Second or fourth drive that attaches to 1A/1B or 3, respectively	9,730	45.00	324	276
	3 Third drive that attaches to Model 2	10,960	50.00	364	310
4920	8100 System Multi-Drive Feature; required for 8809, Model 1B, if Model 2 or 3 is attached	378	1.00	12	10
3101-100	Model 10 Display Terminal; character transmission; RS-232C interface	1,295	70.00	—	—
3101-110	Model 10 Display Terminal with modem cable; character transmission; RS-232C interface	1,360	70.00	—	—
3101-120	Model 12 Display Terminal; character transmission; RS-232C/20 ma current loop interface	1,320	70.00	—	—
3101-130	Model 13 Display Terminals; character transmission; RS-232C/RS-422A interface	1,320	70.00	—	—
3101-200	Model 20 Display Terminal; switch selectable character and block transmission; RS-232C interface	1,495	80.00	—	—
3101-210	Model 20 Display Terminal with modem cable; switch selectable character and block transmission; RS-232C interface	1,560	80.00	—	—
3101-220	Model 22 Display Terminal; switch selectable character and block transmission; RS-232C/20 ma current loop interface	1,520	80.00	—	—
3101-230	Model 23 Display Terminal; switch selectable character and block transmission; RS-232C/RS-422A interface	1,520	80.00	—	—
3102	Thermal Printer; for attachment to 3101	1,295	130.00	—	—
3274-51C	Control Unit	6,450	57.50	188	160
3276-11	Display Station/Control Unit; 960-character display	6,390	30.00	187	159
3276-12	Display Station/Control Unit; 1920-character display	6,570	30.50	192	163

*Includes maintenance.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Monthly Rental*	2-Year Lease*
INPUT/OUTPUT UNITS AND FEATURES (Continued)					
3276-13	Display Station/Control Unit; 2560-character display	6,750	31.50	196	167
3276-14	Display Station/Control Unit; 3440-character display	6,930	32.00	202	172
3277-1	Display Terminal; 480-character display	1,730	9.00	79	67
3277-2	Display Terminal; 1920-character display	2,240	21.00	115	98
3278-1	Display Terminal; 960-character display	2,205	13.00	63	54
3278-2	Display Terminal; 1920-character display	2,340	13.50	67	57
3279-2A	Display Terminal; Four Color, 1920-character Display	3,805	24.00	110	94
3279-2B	Display Terminal; Seven Color, 1920-character Display	4,210	26.50	121	103
3279-3A	Display Terminal; Four Color; 2560-character Display	4,175	25.00	121	103
3279-3B	Display Terminal; Seven Color, 2560-character Display	4,580	27.50	132	112
1720	Switch Control Unit	180	—	5	4
4621	75-Key EBCDIC Typewriter Keyboard	495	2.50	13	11
4622	75-Key EBCDIC Data Entry Keyboard	495	3.50	13	11
4623	75-Key EBCDIC keypunch keyboard	495	3.50	13	11
4624	75-Key ASCII Typewriter Keyboard	495	2.50	13	11
4626	87-key EBCDIC Typewriter/APL keyboard	675	3.50	18	15
4627	87-key EBCDIC Typewriter keyboard	675	3.00	18	15
4628	87-key ASCII Typewriter keyboard	675	3.00	18	15
4629	87-key EBCDIC Typewriter/Text keyboard	675	3.50	18	15
4640	87-key EBCDIC Typewriter Overlay Keyboard	675	3.50	18	15
4651	87-key EBCDIC Attribute Select Typewriter keyboard	675	3.50	18	15
4652	87-key EBCDIC Attribute Select Typewriter/APL keyboard	675	3.50	18	15
4690	Keyboard Numeric Lock	NC	NC	NC	NC
4999	Magnetic Reader Control	405	4.50	11	9
5781	Programmed Symbols DS-2	540	1.50	14	12
5782	Programmed Symbols PS-4	900	4.00	24	20
6340	Security Keylock	35	NC	35***	—
6350	Selector Light Pen for Models 3A or 3B	585	0.50	15	13
6350	Selector Light Pen for Models 2A or 2B	585	0.50	15	13
8775-1	Display Terminal; up to 2560 characters in 9 x 16 matrix	2.975	19.50	79	67
8775-2	Display Terminal; up to 2560 characters in 9 x 16 matrix or 3440 characters in 9 x 12 matrix	3,350	19.50	88	75
1090	Audible Alarm	94	NC	2	2
3622	Feature Storage	756	3.00	20	17
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	425	1.50	11	9
4621	75-Key Typewriter Keyboard	519	2.50	13	11
4622	75-Key Data Entry Keyboard	519	3.50	13	11
4623	75-Key Data Entry Keyboard with keypunch layout	519	3.50	13	11
4626	87-Key Typewriter; APL	708	3.00	19	16
4627	87-Key Typewriter	708	3.00	19	16
4850	Loop Adapter	330	1.50	8	7
4999	Magnetic Reader Control	425	2.00	11	9
6350	Selector Light Pen	614	0.50	15	13
3640 PLANT COMMUNICATION DEVICES					
3641-1	Reporting Terminal	3,100	13.50	—	101**
3641-2	Reporting Terminal	3,705	15.00	—	119**
3642-1	Encoder Printer	6,060	31.50	—	214**
3642-2	Encoder Printer	7,165	38.00	—	253**
3643-2	Keyboard Display	2,575	27.00	—	110**
3643-3	Keyboard Display	3,570	33.50	—	148**
3643-4	Keyboard Display	3,765	35.50	—	154**
3644	Automatic Data Unit	5,500	34.00	—	194**
4905	Manual I/O	1,550	6.50	—	50**
3645	Receive-Only Printer	4,935	44.00	—	214**
3646	Scanner Control Unit	2,680	11.00	—	86**
6351	Magnetic Reader Attachment	661	2.50	—	20**
3631	Plant Communication Controller:				
	1A 250K-byte diskette	27,610	224.00	1,114	948
	1B 500K-byte diskette	29,710	247.00	1,110	1,010
3632	Plant Communication Controller:				
	1A 5-megabyte disk	46,830	273.00	1,716	1,460
	1B 9.2-megabyte disk	49,980	281.00	1,815	1,545

*Includes maintenance.
**5-year lease.
***One-time charge.

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Monthly Rental*	2-Year Lease*
3640 PLANT COMMUNICATION DEVICES (Continued)					
1006	Additional Storage Feature	1,225	10.00	63	54
3211	Data Link Adapter	1,260	10.50	38	32
3701	EIA/CCITT Host	445	4.00	12	10
3703	EIA/CCITT Data Link	445	4.00	12	10
4780	Loop Adapter	987	17.50	33	28
4502	SDLC Communications Feature without clocking; to 9600 bps	1,200	10.50	36	32
6301	Host Communications Feature with clocking	745	3.00	20	17
6302	Host Communications Feature without clocking	500	2.50	12	10
1010/11	Additional Disk Heads for 3632 Plant Communications Controller	1,130	17.00	34	29
COMMUNICATIONS					
4850	Loop Adapter	945	3.50	25	21
3842	Loop Control Unit	5,725	42.50	—	215**
3843	Loop Control Unit	4,680	26.50	153	130
1051	Alternate Voice	455	2	—	15**
5101	Multipoint Tributary	424	4	—	17**
6101	Point-to-Point	212	2	—	9**
7951	Switched Network Back-Up Manual Answer	500	7	—	24**
1550	CCITT V.35 Interface; up to 9600 bps	535	2.00	15	13
1601	SDLC Communications Adapter with Clock	945	8.00	43	37
1602	SDLC Communications Adapter without Clock	882	7.50	36	31
1603	BSC/SS Communications Adapter with Clock	703	3.00	20	17
1604	BSC Communications Adapter without Clock	472	2.50	12	10
3701	EIA RS-232C Interface	420	4.00	12	10
4545	Expanded Function Operator Panel (8140 processor only)	2,520	32.00	87	74
4830	Loop Adapter	635	4.00	21	18
4835	Loop Adapter, Second Lobe	635	4.00	21	18
5200	Multi-Speed Clock	441	1.50	13	11
5501	Switched Integrated Modem	882	6.50	26	22
5660	Digital Data Service Adapter (DDSA)	882	2.00	25	21

*Includes maintenance.
**5-year lease.
***One-time charge.

SOFTWARE PRICES

		Monthly License Fee
5761-DS1	Distributed Processing Control Executive (DPCX)	$236
	Distributed Processing Programming Executive (DPPX):	
5760-010	DPPX/Base	165
5760-AS1	DPPX/ASSM	44
5760-CB1	DPPX/COBOL Compiler	88
5760-LB1	DPPX/COBOL Run-Time Library	16
5760-FO1	DPPX/FORTRAN Compiler	66
5760-LM1	DPPX/FORTRAN Library	33
5760-XR1/01	DPPX/DPS Interactive Map Definition	65
5760-XR1/02	DPPX/DPS Format Management	27
5760-TD1	DPPX/DTMS (Data Base and Transaction Management System)	99
5760-RC1	DPPX/DSC (Data Stream Compatibility)	16
5760-XC1	DPPX/RJE	22
5760-SM1	DPPX/Sort/Merge	22
5760-XC2	DMS/DPPX	93
5760-ED1	DPPX/GEN3644	16
5748-XXG	Distributed Systems Executive (DSX)	192
5735-XR1	Host Command Facility for 8100/DPCX systems	93
5760-XR5/01	DPPX/PT Monitor	38
5760-XR5/02	DPPX/PT Reporter Feature	44