IBM 8100 Information System

MANAGEMENT SUMMARY

Within hours after IBM's Data Processing Division announced the 8100 Information System on October 3, 1978, industry analysts, users, and competitive vendors began analyzing the new product. The 8100 offered food for thought to almost every segment of the data processing industry.

Industry observers pinpointed price and scope as the most surprising aspects of the announcement. Technical innovation centered on the use of 64K-bit memory chips operating at speeds of either 800 or 1500 nanoseconds. The price per bit for the faster memory is about 55 percent below the current System/370 level, and the price of the slower memory is an amazing 84 percent below the System/370 level.

The scope of the 8100 system is fully as interesting as its price. Two operating systems were announced. 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). Sixteen processor models were announced 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 512K bytes for both processors. ▷

Developed and marketed by IBM's Data Processing Division, the 8100 offers both stand-alone and distributed environment capabilities. An 8100 system can support up to 512K bytes of memory, 320 million bytes of disk storage, 4 magnetic tape drives, and a large complement of terminals.

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 12 submodels.

DATE ANNOUNCED: October 3, 1978.

DATE OF FIRST DELIVERY: First customer shipments are planned for 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 or 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), anf floating-point register-register (FR). The word instruction formats are: register-register long (RR-Long), register- ▶
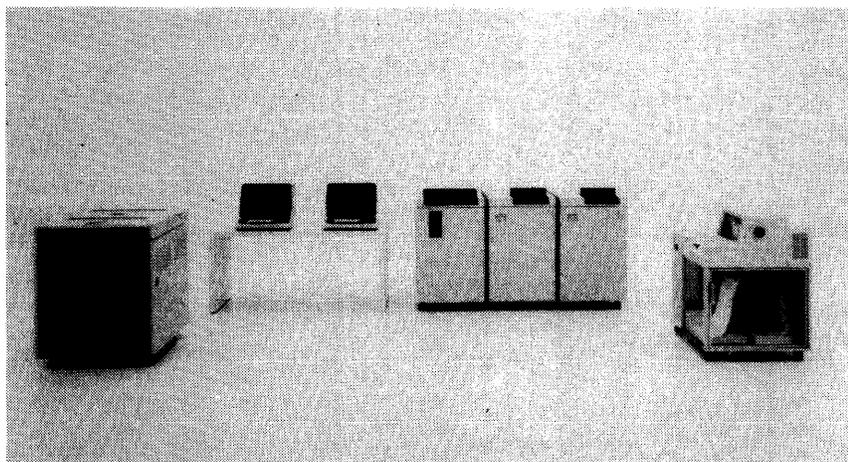
This IBM 8100 configuration includes, from left to right: two 8809 Magnetic Tape Units, two 8775 Display Terminals, an 8100 Processor, two 8101 Storage and I/O units, and a 3289 Line Printer, Model 3. An 8100 system can support up to 512K bytes of memory and 320 megabytes of disk storage.

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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, or 512KB	29MB	6	No	No
8130-A22	256KB, 384KB or 512KB	23MB**	6	No	No
8130-A23	256KB, 384KB, or 512KB	64MB	6	No	No
8130-A24	256KB, 384KB, or 512KB	58MB**	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

* 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.

▷ 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 four groups of four models each: 8130 A2X, 8140 A3X, 8140 A4X, and 8140 A5X. Within each of these groups, 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 distinguishing characteristics of these four processor groups are:

● 8130 A2X — 256K, 384K, or 512K bytes of slower memory; 192 megabytes of disk storage maximum; 14 ports maximum.

● 8140 A3X — 256K or 384K bytes of faster memory; 320 megabytes of disk storage maximum; 19 ports maximum; Expanded Operator Function Panel optional.

● 8140 A4X — 320K bytes of faster memory; 320 megabytes of disk storage maximum; 18 ports maximum; Expanded Operator Function Panel optional; floating-point hardware standard.

● 8140 A5X — 512K bytes of faster memory; 320 megabytes of disk storage maximum; 16 ports maximum.

The Distributed Processing Program Executive (DPPX) used with the 8100 provides a Data Base and Transaction ▷

▶ 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 nanseconds per 16-bit fetch; 8140 processor, 800 nanoseconds per 16-bit fetch.

CAPACITY: 262,144, 327,680, 393,216, or 524,288 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 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 half-word, or a word in length. One general register may hold multiple operands, each of which may be processed independently. ▶

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PERIPHERALS/TERMINALS

DEVICE	DESCRIPTION & SPEED
MAGNETIC TAPE EQUIPMENT	
8809	9-track; 1600 bpi, phase-encoded; 12.5 in ips 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	
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
3287-11	Table-top printer; 80 cps; bidirectional
3287-12	Table-top printer; 120 cps; bidirectional
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
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
3641-1, 2	Reporting terminal; 35- or 70-position keyboard; 22-position display; 5 × 7 dot matrix; up to 9600 bps
3643-2	Keyboard/display; gas panel display; 40 cpl; 240-character display; 7 × 9 dot matrix; up to 9600 bps
3643-3	Keyboard/display; gas panel display; 40 cpl; 480-character display; 7 × 9 dot matrix; up to 9600 bps
3643-4	Keyboard/display; gas panel display; 40 cpl; 1024-character display; 5 × 7 dot matrix; 9600 bps
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 × 16 dot matrix; 94-character set; up to 9600 bps
8775-2	Keyboard/display; light pen; 2560-character display, 9 × 16 dot matrix or 3440-character display, 9 × 12 dot matrix; 94-character set; up to 9600 bps

▷ 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, 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 asynchro- ▷

▶ 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 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. ▶

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8130/8140 SYSTEM MAXIMUMS

	8130 A21-A24	8140 A31-A34	8140 A41-A44	8140 A51-A54
8101 Storage and I/O Units	2	4	4	4
Disk drives (total)*	3	5	5	5
Disk capacity	192MB	320 MB	320 MB	320 MB
Diskette drives	2	2	2	2
8809 tape drives	4	4	4	4
3277 direct-attached displays	24	24	24	24
Communication ports— Loops, SDLC/BSC/SS links**	14	19	18	16
38.4-KB loops	1	1	1	1
Total loops	14	19	18	16
Aggregate BSC/SS data rate (bps/cps)	9600/330	19,200/660	19,200/660	19,200/660

* Includes disk drive in processors and in each 8101 unit.
**Only 10 SDLC ports can be active at one time.

▷ nous protocols; supported terminals include the 3270 (SDLC or BSC), as well as the new 8775 display terminal and the new 3289 and 3287 printers. Also supported are the new 3630 plant communications devices, card I/O (via the new 3289 Model 3 printer), and up to four of the new 8809 magnetic tape drives.

The Distributed Processing Control Executive (DPCX) supports a more limited array of device types and does not support any of the new display station, data collection, printer, or magnetic tape components. 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 will be 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 the IBM's small System/370 computers, except that it is transaction-oriented rather than batch-oriented.

There has been much discussion in the trade press about the increasing competition between IBM's DPD (Data Processing Division) and its GSD (General Systems Division), even to the point of speculation on the possibility of a General-Motors-like organization for IBM. This speculation was not quieted by GSD's October 24 announcement of the impressive system/38. It is interesting ▷

▶ 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. ▶

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▷ to note that a suitably configured 8100 system could perform effectively in the small business environments that constitute the primary market for GSD's System/34 and System/38. However, the 8100 currently lacks two traditional features of small business computer systems: RPG and applications support.

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 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 display and 3284/6/7 printer units can be connected to an 8100 system through one or two 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 (now 2 years old), along with the enhanced 3270 family of display terminals (now 18 months old), 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.

Now that IBM can be counted on to add credibility to — and provide user education for — the concept of distributed processing, users can look forward to improved product lines and marketing approaches that will provide them with a wide variety of choices. □

▶ ● Load register operations — register-to-register format instructions are provided to transfer a byte or half-word from one general register location to another.
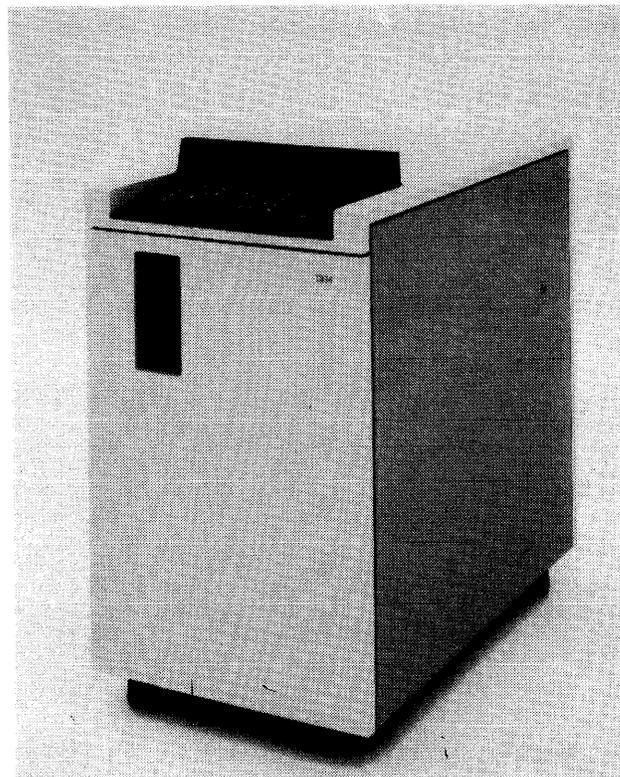
The 8140 processor is shown with the Expanded Function Operator Panel (EFOP). Supplied in addition to the basic panel as a program diagnostic aid, the EFOP provides programmer and operator access to storage, program stop and restart capability, and current operating indicators.

● 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 ▶

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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 six communication links or local loops, while the 8140 can attach up to three, 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 three models; Model A10 has no disk storage, Model A11 has 29 million bytes of disk storage, and Model A13 has 64 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 processor can be configured with communication or display features, type I or type II. Two of the 8101's attached to an 8140 processor can be configured with these features. If an 8809 Model 1B magnetic tape unit is attached to the 8130 processor, only one 8101's may be attached.

If an 8809 Model 1B is attached to an 8140 processor, only 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 two 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 contains 64,520,192 bytes under movable heads. 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 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

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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 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 or 2400 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 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 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:

- 3276 Control Unit/Display Station, Models 11, 12, 13, 14.

- 3287 Printer, Models 11, 12.

- 3289 Line 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 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

- 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 Programming Executive (DDPX) is a general multi-purpose operating system for commercial, interactive, scientific, and plant floor applications. It supports a number of optional licensed programs, including COBOL, FORTRAN, SORT, and a Development Management System. The Distributed Processing Control Executive (DPCX) is a multi-application, 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 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 8401 tape unit, and a wide variety of attachments for terminals, unit record devices, and system-to-system communication.

The DPPX family of licensed software programs includes:

- DPPX COBOL Compiler and COBOL Library

- DPPX Data Base and Transaction Management System ▶

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▶ ● DPPX Distributed Presentation Services

● DPPX Development Management System

● DPPX FORTRAN Compiler and FORTRAN Library

● DPPX Assembler

● DPPX Sort/Merge

● DPPX Parameter Generation Facility for the IBM 3644 Automatic Data Unit

● DPPX 3270 Data-Stream Compatibility

● DPPX RJE Workstation Facility

All of the above DPPX programs are described later in this report.

DPPX is designed for distributed processing configurations. 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 *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 DPCX and host applications.

DPCX is supported by the ACF/VTAM, ACF/TCAM, and EXTM host SNA access methods. The 8100 system is connected to the host via an SDLC line. System Control Program (SCP) support is provided by DOS/VS, 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, inter-

active 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 exists.

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/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 ▶

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▶ 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 CAPABILITY (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 in DPPX/COBOL source code.

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.

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 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.

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. The DPPX/PT Monitor collects performance data, and the DPPX/PT Reporter generates reports on the basis of data collected by the Monitor.

SUBSYSTEM INFORMATION RETRIEVAL FACILITY: Provides the host location with the ability to retrieve incident and status information, execute problem determination routines, and modify, with appropriate control, distributed system control code. This facility will be available for System/370 systems running under OS/VS-VTAM, ACF/VTAM, DOS/VS-VTAM, ACF/VTAM, OS/VS-TCAM, and DOS/VS-EXTM.

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.

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 ▶

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▶ 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 a processor with 348K bytes of memory, 58 million characters of disk storage, 3 printers, 6 display terminals, and 1 communi-cations link. Purchase price is $91,815. The same system can be leased for $2,537 per month under a two-year agreement or rented for $2,981 per month.

EIGHTEEN-TERMINAL 8100 SYSTEM: Includes a processor with 512K bytes of memory, 58 million characters of disk storage, 1 magnetic tape unit, 5 printers, communications links, and 18 information display terminals. Purchase price is $181,702. The same system can be leased for $5,168 per month under a two-year agreement or rented for $5,957 per month.■

EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-Year)	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	$24,000	$122.00	$ 705	$ 600
A22	23 megabytes disk storage, 131K fixed-head capacity	24,720	130.00	729	620
A23	64 megabytes disk storage	25,440	130.00	752	640
A24	58 megabytes disk storage, 131K fixed-head capacity	26,160	138.00	776	660
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	33,060	173.00	1,128	960
A32	256K bytes of main memory, 23 megabytes disk storage, 131K fixed-head capacity	33,780	181.00	1,152	980
A33	256K bytes of main memory, 64 megabytes disk storage	34,500	181.00	1,175	1,000
A34	256 bytes of main memory, 58 megabytes disk storage, 131K fixed-head capacity	35,220	189.00	1,199	1,020
A41	320K bytes of main memory, 29 megabytes disk storage, floating-point arithmetic	40,260	212.00	1,416	1,205
A42	320K bytes of main memory, 23 megabytes disk storage, 131K fixed-head capacity, floating-point arithmetic	40,980	220.00	1,439	1,225
A43	320K bytes of main memory, 64 megabytes disk storage, floating-point arithmetic	41,700	220.00	1,463	1,245
A44	320K bytes of main memory, 58 megabytes disk storage, 131K fixed-head capacity, floating-point arithmetic	42,420	228.00	1,486	1,265
A51	512K bytes of main memory, 29 megabytes disk storage	45,540	233.00	1,739	1,480
A52	512K bytes of main memory, 23 megabytes disk storage, 131K fixed-head capacity	46,260	241.00	1,763	1,500
A53	512K bytes of main memory, 64 megabytes disk storage	46,980	241.00	1,786	1,520
A54	512K bytes of main memory, 58 megabytes disk storage, 131K fixed-head capacity	47,700	249.00	1,810	1,540
1710	128K bytes additional storage for 8130 processor; maximum one per processor (cannot be used if 1720 storage is used)	2,250	7.50	82	70
1720	256K bytes additional storage for 8130 processor; maximum one per processor (cannot be used if 1710 storage is used)	4,500	14.50	165	140
1490	128K-byte storage increment for 8140 processor, models A31 through A34; maximum one per processor	6,240	30.00	306	260
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	6,500	17.00	201	171
A11	Provides 29 megabytes disk storage with movable heads	14,970	55.50	477	406
A13	Provides 64 megabytes disk storage with movable heads	16,410	63.50	524	446
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	405	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	2,400	10.50	71	60
5500	Non-Switched Integrated Modem, 600/1200 bps; requires 1601 SDLC Communications Adapter with Clock or 1603 BSC/SS Communications with Clock	668	5.00	19	16
Features for 8130 and 8140 Processors:					
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	900	4.00	27	23
1502	Display and Printer Attachment, Type II	400	0.50	13	11

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-Year)	2-Year Lease
PROCESSOR OPTIONS AND FEATURES (Continued)					
1503	Communications Attachment, Type I; provides attachment of loops and communication ports (8101 A11 and A13 units only)	900	4.00	27	23
1504	Communications Attachment, Type II	400	0.50	13	11
1505	Display and Printer Adapter	2,300	15.00	75	64
1506	Additional Display and Printer Adapter	420	3.00	13	11
1507	Diskette Drive/Tape Attachment	900	4.00	27	23
INPUT/OUTPUT UNITS AND FEATURES					
4520	Second Diskette Drive for 8101 Storage and Input/Output Unit; 1 megabyte	2,880	27.50	94	80
4521	Magnetic Tape Attachment for 8101 Storage and Input/Output Unit	1,800	9.00	59	50
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	900	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
3287-11	Line Printer; 80 cps	5,875	51.50	196	167
3287-12	Line Printer; 120 cps	6,250	62.50	233	198
4110	Friction Feed Paper Handling	160	0.50	6	5
8700	Variable Width Forms Tractor	160	0.50	6	5
3289-1	Line Printer; 155 lpm	8,900	105.00	368	313
3289-2	Line Printer; 400 lpm	13,250	179.00	556	473
3289-3	Line Printer; 500 lpm	13,250	179.00	556	473
1090	Audible Alarm for 3289-1 or 3289-2 line printer	175	—	6	5
1130	Text Print Feature for 3289-1 or 3289-2 line printer	210	—	7	6
8809	Magnetic Tape Units:				
	1A First drive that attaches to 8101 Storage and I/O Unit	10,440	48.00	341	290
	1B First drive that attaches directly to 8130/40 processor	12,780	63.00	417	355
	2 Second or fourth drive that attaches to 1A/1B or 3, respectively	9,270	43.00	303	258
	3 Third drive that attaches to Model 2	10,440	48.00	341	290
4920	8100 System Multi-Drive Feature; required for 8809, Model 1B, if Model 2 or 3 is attached	360	1.00	12	10
8775-1	Display Terminal; up to 2560 characters in 9 × 16 matrix	2,835	19.00	74	63
8775-2	Display Terminal; up to 2560 characters in 9 × 16 matrix or 3440 characters in 9 × 12 matrix	3,195	19.00	83	71
1090	Audible Alarm	90	NC	2	2
3622	Feature Storage	720	3.00	19	16
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	405	1.50	11	9
4621	75-Key Typewriter Keyboard	495	2.50	13	11
4622	75-Key Data Entry Keyboard	495	3.50	13	11
4623	75-Key Data Entry Keyboard with keypunch layout	495	3.50	13	11
4626	87-Key Typewriter; APL	675	3.00	18	15
4627	87-Key Typewriter	675	3.00	18	15
4850	Loop Adapter	315	1.50	8	7
4999	Magnetic Reader Control	405	2.00	11	9
6350	Selector Light Pen	585	0.50	15	13
3640 PLANT COMMUNICATION DEVICES					
3641-1	Reporting Terminal	2,955	13.50	—	91*
3641-2	Reporting Terminal	3,530	15.00	—	107*
3642-1	Encoder Printer	5,775	31.50	—	191*
3642-2	Encoder Printer	6,825	38.00	—	226*
3643-2	Keyboard Display	2,445	27.00	—	99*
3643-3	keyboard Display	3,400	33.50	—	133*
3643-4	Keyboard Display	3,590	35.50	—	138*
3644	Automatic Data Unit	5,240	34.00	—	174*
4905	Manual I/O	1,480	6.50	—	45*
3645	Receive-Only Printer	4,700	44.00	—	191*
3646	Scanner Control Unit	2,555	11.00	—	78*
6351	Magnetic Reader Attachment	630	2.50	—	19*
3631	Plant Communication Controller:				
	1A 250K-byte diskette	26,300	224.00	993	845
	1B 500K-byte diskette	28,300	247.00	1,058	900
3632	Plant Communication Controller:				
	1A 5-megabyte disk	44,600	273.00	1,533	1,305
	1B 9.2-megabyte disk	47,600	281.00	1,622	1,380

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EQUIPMENT PRICES

		Purchase Price	Monthly Maint.	Rental (1-Year)	2-Year Lease
3640 PLANT COMMUNICATION DEVICES (Continued)					
1006	Additional Storage Feature	1,170	10.00	58	49
3211	Data Link Adapter	1,200	10.50	35	30
3701	EIA/CCITT Host	424	4.00	12	10
3703	EIA/CCITT Data Link	424	4.00	12	10
4780	Loop Adapter	940	17.50	31	26
4502	SDLC Communications Feature without clocking; to 9600 bps	1,200	10.50	35	30
6301	Host Communications Feature with clocking	710	3.00	19	16
6302	Host Communications Feature without clocking	477	2.50	12	10
1010/11	Additional Disk Heads for 3632 Plant Communication Controller				
COMMUNICATIONS					
4850	Loop Adapter	945	3.50	25	21
3842	Loop Control Unit	5,725	42.50	—	215*
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	510	2.00	15	13
1601	SDLC Communications Adapter with Clock	900	8.00	41	35
1602	SDLC Communications Adapter without Clock	840	7.50	35	30
1603	BSC/SS Communications Adapter with Clock	670	3.00	19	16
1604	BSC Communications Adapter without Clock	450	2.50	12	10
3701	EIA RS-232C Interface	400	4.00	12	10
4545	Expanded Function Operator Panel (8140 processor only)	2,400	30.50	82	70
4830	Loop Adapter	605	4.00	20	17
4835	Loop Adapter, Second Lobe	605	4.00	20	17
5200	Multi-Speed Clock	420	1.50	13	11
5501	Switched Integrated Modem	840	6.50	25	21
5560	Digital Data Service Adapter (DDSA)	840	2.00	24	20

* 5-year lease.

SOFTWARE PRICES

	Monthly License Fee
Distributed Processing Control Executive (DPCX)	$215
Distributed Processing Programming Executive (DPPX):	
DPPX/Base	150
DPPX/ASSM	40
DPPX/COBOL Compiler	80
DPPX/COBOL Run-Time Library	15
DPPX/FORTRAN Compiler	60
DPPX/FORTRAN Library	30
DPPX/DPS Interactive Map Definition	65
DPPX/DPS Format Management	25
DPPX/DTMS (Data Base and Transaction Management System)	90
DPPX/DSC (Data Stream Compatibility)	15
DPPX/RJE	20
DPPX/SORT	20
DMS/DPPX	85
DPPX/GEN3644	15
Distributed Systems Executive (DSX)	175
Host Command Facility for 8100/DPCX systems	85
DPPX-PT Monitor	35
DPPX-PT Reporter Feature	40